



FRIDAY, FEBRUARY 27, 1903.

CONTENTS

ILLUSTRATED:

Suburban Locomotive of the Great Eastern of Eng-	144
land	144
Pratt Side Dumping Coal Car.....	147
Purifying Water for Locomotives.....	148
Replacement of an Old Bridge.....	148
A New Double-Acting Tandem Gas Engine.....	149
The Sacred Bridge at Nikko.....	149
A Few European Locomotives.....	151
Umbrella Shed for Train Platforms.....	151
A Proposed Single Drive Locomotive.....	154
Notes from West Albany.....	155

CONTRIBUTIONS:

The Lens Mirror Acetylene Headlight.....	143
Destroying a Chimney.....	143
For Municipal Ownership.....	143

EDITORIAL:

Suburban Locomotives	152
The U. S. Steel Preferred-Stock Retirement.....	153
January Accidents	153
Editorial Notes	152, 154
New Publications	154
Trade Catalogues	154

MISCELLANEOUS:

A Business-View of River Improvement.....	143
The Taylor-White Process of Treating Tool Steel.....	144
Block Signals on American Railroads.....	146
The Telephone on the C. St. P. M. & O.....	146
British Railroad Reform.....	147
An Engineer Should Know Bookkeeping.....	149
Train Accidents in the United States in January.....	149
The New Rapid Transit Plan.....	150
The Railroad to Astrachan.....	154
Easy Money	156

GENERAL NEWS:

Technical	156
The Scrap Heap	157
Locomotive Building	158
Car Building	158
Bridge Building	158
Meetings and Announcements	158
Personal	159
Elections and Appointments.....	159
Railroad Construction	159
General Railroad News.....	160

Contributions

The Lens Mirror Acetylene Headlight.

Jersey City, N. J., Feb. 24, 1903.

TO THE EDITOR OF THE RAILROAD GAZETTE:

We think it is proper, in view of the Coroner's verdict on the Westfield case, to state that the Central Railroad of New Jersey has been planning for a long time to do away with the oil headlight. They first tried the electric headlight. Early last summer they equipped a number of their fast passenger engines with the lens mirror acetylene light. After about six months trial the lens mirror light was officially adopted and as rapidly as possible will be applied to all the engines on the road. There is never more than a few cubic inches of gas on hand at any time and in the event of a wreck the little gas flame would be instantly blown out. The generator contains but eight pounds of the large carbide lumps each weighing a pound or more. These large hard lumps can be made to give off gas only very slowly, even when water is poured over them, and could not possibly cause or add to a fire.

S. W. RUSHMORE.

Destroying a Chimney.

Pennsylvania Lines West of Pittsburgh, / Louisville, Ky., Feb. 16, 1903.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have read with interest in your issue of February 13 the article by William Wallace Christie, entitled "Chimney Notes," telling of the tearing down of a chimney at Paterson, N. J., about a year ago. It is to be assumed, I suppose, that owing to physical conditions surrounding the site of the chimney at Paterson, it was impossible to throw it, which, in my opinion, would have been much cheaper than the method employed.

About four years ago, while in charge of some work at Indianapolis, Ind., we had to tear down an old brick chimney of about 100 ft. in height, 12 ft. x 12 ft. at the base, and about 8 ft. at the top. Vacant ground in one direction gave us the opportunity of throwing the chimney, which was done as follows:

On the side on which it was desired to throw the chimney, underpinning of yellow pine was introduced for a distance of over half the width of the chimney, the blocking aggregating in thickness about 18 in. After the underpinning was completed, the wall being entirely removed from that side, the blocking was thoroughly saturated with coal-oil and a pile of waste and other combustible material placed around the same; fire was then applied, and in about an hour the chimney toppled over, falling within 10 ft. of the line desired.

The chimney in question was probably 20 or 30 years old, and was made of the ordinary hard burned brick of the time of its construction. It was expected that the

majority of the brick would be worthless, but, in fact, very few, comparatively speaking, were damaged, and after cleaning off the mortar, they were used as inside brick in the walls of a large building then in course of construction.

PAUL JONES, *Engineer Maintenance of Way.*

For Municipal Ownership.

New York, Feb. 17, 1903.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Both the elevated and "rapid transit" roads in New York city are now under one control, and as our surface roads have passed into the hands of bankers it is a matter of short time before all of the appliances for the transportation of passengers in the Boroughs of Manhattan and the Bronx are held by one company, or in one interest, if this is not virtually the fact to-day as some contend. From this time on for 50 if not for 75 years it is probable all our means of passage between homes and business or amusements will be governed by the business considerations of those who will have, and use, the aid of large capital to prevent the possibility of competition, or control of their methods and rates.

Municipal building and ownership, but not necessarily municipal operation, of roads that will compete both in the convenience offered to passengers and in rates of fare charged seems to offer a more certainly automatic relief than either laws passed or charter provisions. Most of your readers will probably agree with me that the superior service of American railroads, their low freight rates and the fact that our average passenger fare is about equal to the third-class fare on British railroads, is more due to the fact that in nearly all States it was possible to build competing roads where the fares or accommodations were unsatisfactory, than to any other cause. This was inconvenient to vested capital, which evolved the State Railroad Commissioner as a successful check to competitive building.

In effect, the additions to the roads now under construction, that are proposed by the Rapid Transit Commission, will have the same result as the institution of State Railroad Commissions—they will effectually prevent competition. If on the other hand the city would build, say a four-track underground road down Eighth avenue and Hudson street into Church street to the South Ferry, and thence into Pearl, through East Broadway and Suffolk street to the bridge head, and from that by Mr. L. L. Buck's proposed diagonal avenue to either First or Second avenues, a potentiality for competition would be created and remain efficient as long as the road remained in municipal control, unless it should be leased to the combination already in possession.

This proposed road would undoubtedly cost more than the proposed additions to the present route. It would, however, be more efficient and serve localities now left without convenient transportation facilities. In addition to this there is small doubt that it could be leased with the provision that the rate of fare should not exceed 3 cents. If this were done and the existing roads were forced thereby to reduce their fares to the same figure the community would save \$12,000,000 a year, taking 600,000,000 as a fair number of passengers for the two Boroughs. This saving would justify a much larger expenditure than is possible for the route suggested with all the extensions necessary to develop territory not now fully occupied. On the improbable supposition that no reduction in fares would follow the building of a competing route we could confidently expect a better service through a desire to attract more passengers.

In considering any plan for advancing the wealth and convenience of the people of this city advice should be sought from that conservative wisdom which less than 100 years ago put a red sandstone back on the City Hall on the plea that no one would go far enough up town to see its north side, and though such wisdom should not find place on any commission which is intended to accomplish results, I hope for its kindly comments on this proposition.

EDWARD P. NORTH, *M. Am. Soc. C. E.*

A Business View of River Improvement.*

BY S. WHINERY.

In September, 1901, Mr. R. C. McCalla presented before the American Society of Civil Engineers a paper entitled "Improvement of the Black Warrior, Warrior and Tombigbee Rivers in Alabama." That paper was printed in the *Proceedings of the Society* for April, 1902. In the October *Proceedings* were printed important discussions of the paper by several members of the Society. The most interesting of those discussions for our present purposes was by Mr. Whinery, and it is printed below. It gives a broader view than is generally taken in considering this interesting subject. The nation would be richer if members of Congress would read what Mr. Whinery says, and think about it.]

In all these projects for improving waterways for navigation, the question of the quantity of business to be accommodated must be carefully considered. It is not sufficient to assert that the territory penetrated is capable of affording a large business by the development of its natural resources; there must be a demand for these products along the route or at its terminals. The great

deposits of coal that are tapped by the headwaters of the Warrior and Tombigbee Rivers will undoubtedly all be mined in the future and will find a market. It is not at all clear that this market will be found at the City of Mobile, or at any other points that can be served by river transportation better than by rail transportation.

According to the census of 1900, Mobile had a population of a little less than 38,500. In 1890 the population was slightly greater than 31,000. There is no reason to believe that, in the future, it will become a very large city, and still less reason to expect that it will become a great manufacturing center. The local consumption of coal, therefore, is quite certain to be comparatively small.

To what extent coal may be exported from this country is yet problematic, and even if the export business should become very large it is not at all certain that Mobile would secure a very large share of that business. The city is at the head of Mobile Bay, some 30 miles from the open Gulf, and it is reached through a long stretch of artificial channel which will, doubtless, require the expenditure of large sums of money for maintenance, and which, at best, is somewhat difficult of navigation. The construction and maintenance at Mobile of a harbor of sufficient capacity to accommodate a very large export business will involve a further very large expense. The distance to European ports is notably greater than from Norfolk and other points on the Atlantic seaboard where coal is available for export. On the other hand, Mobile is much nearer to Mexican, West Indian and South American ports depending for their coal supply largely upon importation.

There are no large cities in the region that would probably be supplied with coal through Mobile, as New Orleans will probably continue to get the bulk of its supply by the Ohio and the Mississippi Rivers, and Galveston could probably be supplied more economically by rail. Therefore, there is no assurance of a market at Mobile that would justify the very large expenditures of money required to make a satisfactory water route between the Warrior coal field and that city. Nor is it likely that any great points of coal consumption will be developed in the intermediate territory along the river. It is tacitly admitted by the author that the commerce of the region, other than relates to coal, could probably be taken care of at least as cheaply by rail as by river. In any event, it seems safe to assert that, whatever may develop in the future, there exists no commercial justification for these expensive improvements at this time. Even if it were certain that Mobile would supply an adequate market for the products along the route, it may be questioned whether, when all things are considered, the commercial business of the region served could be more economically transported to that market by water than by rail. Excluding the one item of coal, experience seems to indicate conclusively that in the great region of the Mississippi Valley river transportation cannot compete successfully with rail transportation.

The history of the rise, the splendid achievement, and the decadence, in the face of rail competition, of water transportation on the Mississippi River and its tributaries has never been adequately written. Such a history would be as interesting as a fairy tale, and it would teach lessons that have an important bearing on present transportation problems. There are plenty of men yet living who saw these rivers literally alive with commerce. They can recall the time when the Ohio and the Mississippi Rivers carried great fleets of vessels of all kinds, from the rude flatboat to the gorgeous floating palace, all loaded down with the commerce of the productive and prosperous region through which they flow. The shipyards along their banks were busy with the construction of new vessels. But this magnificent river commerce has declined until it may be said to have practically disappeared, although the actual commerce of the region has grown to many times its volume in the days when river transportation was in its prime. The railroad has taken the place of the steamboat. There must be sufficient reason, or reasons, for this great change. Commerce, in attaining its end, seeks the lines of least resistance. The decadence of this river transportation must be accepted as proof that, all things considered, the steamboat could not compete successfully with the railroad.

Analogy drawn from the wonderful expansion and success of water transportation on the Great Lakes, are totally inapplicable to ordinary river transportation. The conditions are entirely different. The Great Lakes lie mostly between parallels of latitude which also embrace the most wonderful development of human activity and commercial enterprise that the world has ever witnessed. Between the parallels of 40 deg. and 45 deg. north lie a chain of great cities the like of which, in their number, in their rapid growth, in their present population, and in their commercial importance, can be found nowhere else in the world. The commerce of all this region is more or less tributary to transportation on the Great Lakes. Around their western end lies the great grain-producing region of the United States and Canada, and the course of this grain to its market is parallel with their length. Along their course and toward their westerly end are situated the most wonderful iron and copper mines yet developed on the Continent. At their eastern end is found the most extensive and valuable coal region developed in the Western Hemisphere. Within the zone and in the prolongation eastward of the general axis of the Lakes is the commercial metropolis of

*From the *Proceedings of the American Society of Civil Engineers*, October, 1902.

North America. The region tributary to them abounds in every element necessary to stimulate agriculture, manufactures and commerce. The minerals from the west and the coal from the east must be brought together. These lakes, with their connecting rivers, aided by comparatively inexpensive improvements, barring the ice of winter, present almost ideal conditions for inland water transportation.

For these reasons, lessons drawn from the results of channel improvement on the Great Lakes must be applied with the greatest caution to the problems of improving our river systems. Does any one believe that if the Mississippi and the Ohio Rivers, between Pittsburgh, St. Louis and New Orleans, had navigable channels that would accommodate the present vessels on the Lakes, their commerce could ever approach, much less equal, that of the Great Lakes?

It is not to be overlooked that these rivers possess now, and always have possessed, during as many months in the year as the Lakes are open for navigation, a capacity for navigation sufficient to accommodate a much greater commerce than they ever carried even in the palmiest days of river transportation. The decadence of their commerce, therefore, must be sought in causes other than their lack of navigable capacity, and he would be a bold prophet who would predict that their former supremacy could be restored by any amount of channel improvement.

If Congress could be brought to consider the question of river and harbor improvements from the cool and deliberate point of view of the practical business man, there would be a revolution in the character of our River and Harbor bills. How many members of that body, who urge and vote appropriations for many government improvement works, could be induced, were they as rich as Croesus, to invest capital in the same projects, as private commercial enterprises, even if they could control and reap all the profits both actual and contingent? What same business corporation, for instance, if it owned all the territory in Kentucky and Tennessee tributary to the Cumberland River, would think it wise business policy to enter upon a project to improve that river at a cost of many millions of dollars? The Government is now engaged upon such a project, involving, if the speaker's memory is correct, no less than 22 locks and dams between the head of navigation and Nashville. It is safe to assert that a fair interest on the cost of this project, when completed, would be more than sufficient to pay the whole of the transportation charges by rail on all the business that the improved river would ever attract.

Applying the same line of thought to the improvements in progress and contemplated on the Mobile River and its tributaries, it may well be questioned whether they will ever yield returns sufficient to justify their construction. Considering all the conditions, it is an open question whether, if the coal deposits penetrated were all owned by a giant corporation and Mobile was the chief market for the coal, it would be found more economical to make use of the improved water route, rather than of the railroads, for supplying that market. Time does not permit the discussion of this question in detail, though some of the facts have been referred to by others in the discussion of this paper.

The Taylor-White Process of Treating Tool Steel.

The sub-committee of the Franklin Institute, composed of Messrs. Charles Day, James Christie, Coleman Sellers, Arthur Falkenau and Wilfred Lewis, has presented a report recommending the award of the Elliott-Cresson medal to Messrs. Fred W. White and Maunsell Taylor. A review of the present status of the Taylor-White process is also given, together with the results of a number of tests made by the committee.

We have published the results of similar tests with the Taylor-White steel, but none showed the relative value of various tools, and in the latter connection the following table from the present report is of interest:

Tool-steel tested.	Exp. mate- rial. No.	Carbon in Feed. Depth of almed cut. In. In.		Cutting speed at. In. In.	Duration of cut.	Average Cutting speed obtained.	Condition of tool at end of run.	Remarks. In.
		in material.	Feed. cut. In.					
T. W. H. 2313.	1	.87	1/16	3/16	11	20	Fair	5 1/2" travel
Mushet	2	.87	1/16	3/16	5	(*13 1/2)	Point gone	1 15/16 "
Mushet	3	.87	1/16	3/16	3 1/2	(†12 1/2)	Completely gone	1 1/2 "
Sanderson	4	.87	1/16	3/16	3 1/2	20	Completely gone	1 7/8 "
Boreas	5	.87	1/16	3/16	4 1/2	20	Completely gone	2 "
Mushet	16	.87	1/16	3/16	3	4	Completely gone	.....
Baeburn	17	.87	1/16	3/16	3	20	Fair	1 3/4 "
Mushet	18	.87	1/16	3/16	3	20	Gone	1 3/4 "
T. W. M. E. 2806.	6	.10	1/16	3/16	140	20	Good	39 3/4 "
Sanderson	8	.10	1/16	3/16	72	20	Fair	19 3/4 "
Mushet	9	.10	1/16	3/16	72	1 1/2	Gone	1 3/4 "
Boreas	10	.10	1/16	3/16	72	6 1/2	Gone	6 3/4 "
Mushet	11	.10	1/16	3/16	60	19	Gone	15 3/4 "
Sanderson	17	.10	1/16	3/16	82	19 1/4	Gone	22 1/2 "
Benj. Atha	13	.10	1/16	3/16	82	13	Gone	15 1/4 "
T. W. M. E. 2757.	14	.10	1/16	3/16	156	20	Good	40 1/4 " †
T. W. B. 0.3.	19	.91	1/16	3/16	70	20	Gone	16 7/16 "
Boreas	20	.91	1/16	3/16	55	20	Good	12 3/4 "
Boreas	21	.91	1/16	3/16	60	38	Gone	20 9/16 "
Mushet	22	.91	1/16	3/16	50	20	Gone	11 9/16 "
Benj. Atha	23	.91	1/16	3/16	50	20	Good	11 5/8 "
T. W. B. 0.3.	24	.91	1/16	3/16	70	20	Good	16 1/2 "
Benj. Atha	25	.91	1/16	3/16	55	3 1/2	Gone	2 3/16 "

* Examination of tool showed that it failed long before end of test.
† Point of tool red-hot for 15 minutes.

† Point of tool red-hot for 13 minutes.

In making the tests it was the plan to run the tools at the same depth of cut and feed, varying the speed in order that each tool should last 20 minutes. The relative

efficiency of the treated tool and best untreated tool is 11 to 3 or more than 3.5 to 1, for the soft forging (10 carbon) 156 to 70 or 2.2 to 1, and for the cast-iron 70 to 55 or slightly less than 1.3 to 1. These figures show that for steel the efficiency is much greater for hard forgings than for soft, but even in the latter case exceeds two to one, while as might be expected the saving on cast-iron is much less, being about 1 1/4 to 1. On hard castings, however, the gain is much more, often reaching 2 to 1, and on this account it is well adapted to certain work.

Suburban Locomotive of the Great Eastern of England.

Mr. Holden's 10-coupled suburban tank locomotive is not new to readers of the *Railroad Gazette*. We have already published information concerning it, but this is the first opportunity that we have had to present in detail the many interesting features of this machine.

The Great Eastern Railway has an enormous suburban traffic, and it was for the purpose of relieving the congestion at certain periods of the day that it became necessary to give the question of suitable motive power particular attention. The locomotive is designed to handle gross loads of 370 long tons, trains carrying 1,200 passengers each; and it is quite obvious that to do this a locomotive of unusual power is necessary in order that trains can be started quickly. In 10 miles the number of starts and stops is about 15. Some time ago Mr. Holden carried out a series of observations, the result of which showed that the average of 30,000 stops was 27 seconds per stop, and he came to the conclusion that it was necessary that a speed of 30 miles an hour must be attained in not more than 30 seconds from starting if the traffic was to be handled satisfactorily.

In point of total weight it is not larger than other engines in use in England; but it is unusually high and all of the weight rests upon the drivers, including the fuel and water. The total weight is between 60 and 70 tons, in working order. There are three simple cylinders, 18 1/2 in. x 24 in.; one between the frames, and one on each side. The boiler contains 3,010 sq. ft. of heating surface and the grate area is 42 sq. ft. The fire-box extends over the frames on each side, as will be seen by the illustration. The crown-sheet of the fire-box has a decided curve, which is no doubt a desirable feature for this class of engine inasmuch as it offers unusual opportunities for the rapid escape of steam from the highly heated surfaces. The grate is in three separate parts, and three ash pans are also provided, the two smaller pans at the sides being separate from that in the middle. In the bottom of the smoke-box is an inclined plate, covered with tiles, and two circular doors in front give easy access to the interior for the removal of cinders. The valves are of the usual type, namely, D valves, and one steam chest serves for the middle and right cylinder.

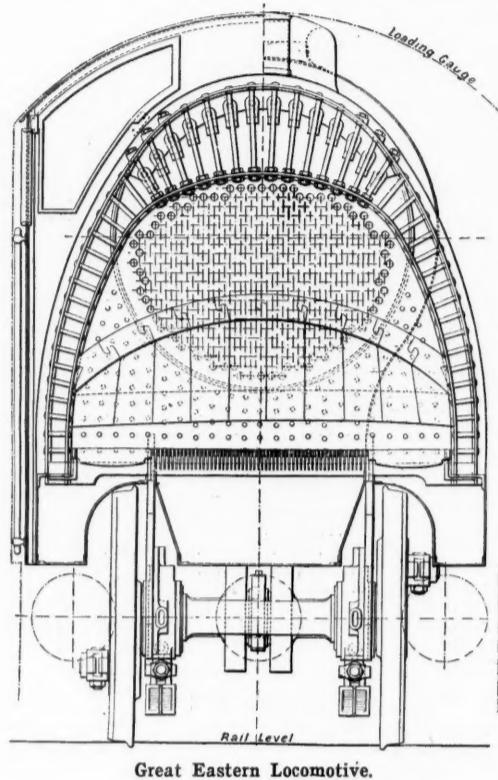
The inside diameter of the boiler is 61 1/2 in. at the smallest ring and it contains 395 1/4 in. tubes 15 ft. 11 in. long. It will be seen that the boiler is unusually large for English practice, and is, indeed, about twice as large as that of the normal express engine. The grate is 6 ft. long and 7 ft. wide. Owing to the extreme height of the engine, or, rather, to the small clearance on English roads, it was necessary to cut down the height of the stack, as will be seen from the sectional elevation. The stack is virtually nothing more than an upper petticoat pipe, with a small extension outside of the smoke-box. Another peculiarity is also the exhaust pipe which has triple annular openings. The working steam pressure is 200 lbs., and six 3 1/2 in. relief valves are provided. Four of these are automatic, and two, over the fire-box, can be controlled by the engineman from a lever extending into the cab. The tank holds 1,300 gallons and the coal capacity is two tons.

Special attention has been given to the provision of ample sanding apparatus, and the sand is projected on the rail by compressed air. There are two large air reservoirs under the boiler near the front end, the forward one supplying the sand ejectors. Air is pumped into the

the sander and not leaving enough to work the brakes. The sanding device is worked by a small lever fastened to the handle of the throttle lever.

The use of three cylinders is by no means new in England, and we have often had occasion to refer to the three cylinder compounds designed by Mr. F. W. Webb, of the London & Northwestern. Recently several three cylinder compounds (Smith's system) have been put in service by Mr. S. W. Johnson on the Midland. The present arrangement is peculiar in that all three of the cylinders are horizontal, the middle one not being inclined. This arrangement made necessary the design of a special connecting rod for the middle cylinder. The leading axle is bent and the connecting rod is forked, the bent axle passing through the fork. This is clearly shown by our illustration. We do not know of any other similar design.

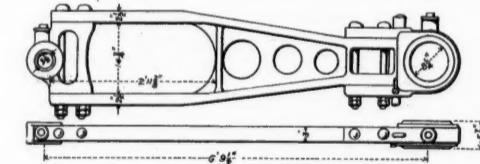
The eccentrics for all three cylinders are keyed on



Great Eastern Locomotive.

the third axle from the front. Reversing is effected by a hand wheel and screw in the cab. The drivers on the third axle are blind, and the rear ones have about 1/2 in. side play in either direction. The coupling rods have ball and socket joints, which should prove an admirable arrangement for making the engine flexible in curving.

The cranks are set at 120 deg.; the middle cylinder driving the second axle and the outside cylinder being connected to the third. Such an arrangement, while undoubtedly having many advantages, has nevertheless complicated the problem of accurate balancing. Mr. Holden

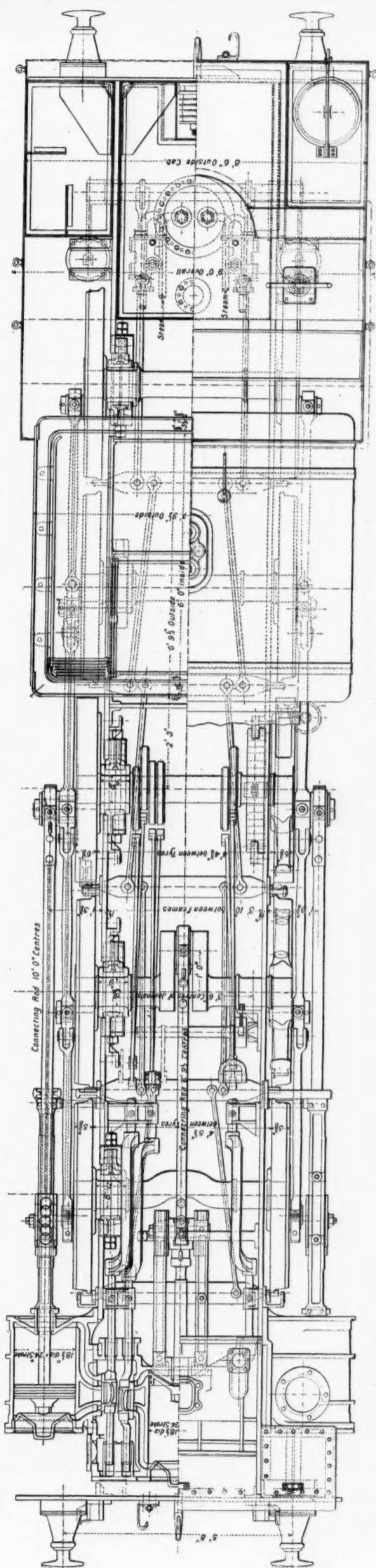
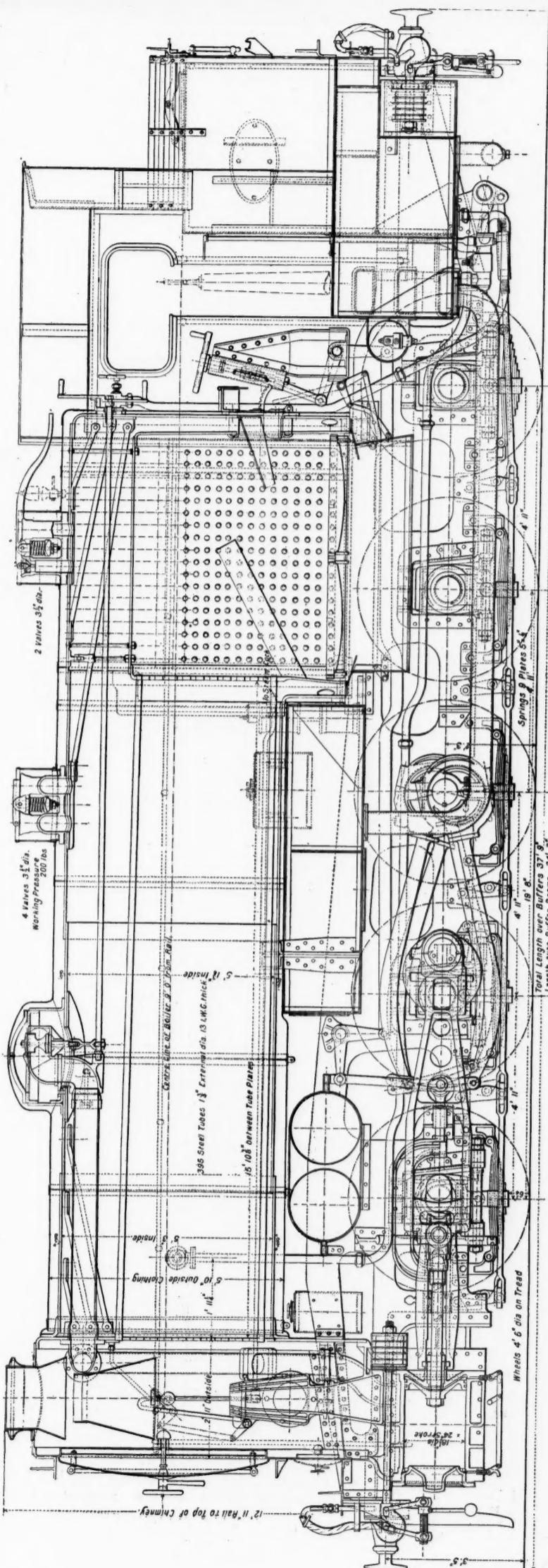


Connecting Rod of Middle Cylinder.

has departed from the usual rule, and has balanced all of the reciprocating weights, instead of two-thirds, as is the general rule in England and America. The counterweights are made of melted lead run between thin plates bolted to the wheels, so that any error in the calculated counterbalance can be corrected. The drivers are 54 in. in diameter.

For a three-cylinder simple engine the formula for tractive effort becomes $\frac{1}{2} \frac{p d^2}{D}$ in which the symbols have the usual significance. If 80 per cent. of the boiler pressure is available as mean effective pressure at starting, the calculated maximum tractive effort becomes 36,500 lbs. Assuming that the gross load is 370 short tons (740,000 lbs.) and that the average resistance per ton up to a speed of 30 miles an hour is 15 lbs. and also that the rate of acceleration is uniform—a calculation according to well-known laws of mechanics indicates that a uniform tractive effort of about 38,500 lbs. would be necessary in order to attain a speed of 30 miles an hour in 30 seconds. In doing this the average horse-power developed would be about 1,500, while at the higher speed the maximum horse-power would reach 3,000. The above calculations are only approximate, but they indicate that the predicted performance with such heavy loads is beyond the capacity of the locomotive. We are indebted to the *Engineer*, London, for the illustrations and general details.

first reservoir and passes through a non-return valve to the second reservoir. This arrangement was provided in order to prevent too much air from being withdrawn by



Ten-Coupled Suburban Tank Locomotive—Great Eastern Railway of England

Designed by MR. JAMES HOLDEN, Locomotive Superintendent, Great Eastern Railway or

Block Signals on American Railroads.

The length of railroad in the United States which is worked by the block system is now nearly 30,000 miles, or, roughly, 4,000 miles more than it was two years ago. The number of miles on each road which uses the system is shown in the following table, which is arranged on the plan of that published in the *Railroad Gazette* Jan. 11, 1901, except that the detailed statements, showing termini of the sections block-signaled, are omitted. As in that table, the mileage is classified into single-track, double-track and four-track, automatic; and single-track, double-track and four-track manual. The Pennsylvania and the Reading have short pieces of three-track line, which are entered in separate items. The six-track and eight-track lines of the Illinois Central also cause a discrepancy between the grand total and the sum of the totals of the several classes.

It will be seen that the total length of road (not length of track) worked by automatic signals, is (after deducting the three-track items entered twice) 3,877 miles; and the total length of manual signaling (deducting the three-track duplication) is 25,856.7 miles; a total of 29,733.7.

The tabulation of the totals of the table appears as follows:

	Miles.	Miles.
Automatic, single track	875.2	
Double track	2,691.4	
Four track	233.6	
Illinois Central	91.0	
Manual, single track	19,360.3	
Double track	6,029.6	
Four track	524.7	
Automatic and manual, total	29,805.8	
Deduct 3-track lines entered twice	72.1	
Total, as shown in "total" column	29,733.7	
Deduct 18 miles (Chicago 6, Atlanta 12) entered twice	18	
Total on which block signals are used	29,715.7	
Deduct lines on which block signals are used partially or for passenger trains only		
Delaware, Lackawanna & Western	750	
Michigan Central	242	
Rio Grande Western	7	
Southern Railway	5,935	
Net mileage of road worked wholly by block system	22,781.7	
A number of roads still report, as they did in 1900, that on most of their lines the block signals are		

used only for passenger trains. The statistics of these roads are accompanied by notes explaining this feature.

An absolutely correct statement of the number and kind of automatic signals in service on Jan. 1, 1903, is impracticable, but a sufficiently accurate classification is as follows: Of the old clockwork signals, 1,041 were installed and a large proportion are still in use. There are in service 4,873 enclosed disks; 4,685 electric semaphores; 3,420 electro-pneumatic semaphores. One hundred and twenty-one Hall electro-gas semaphores, first introduced last year, were put in service in the latter part of 1902.

The ninth column in the table contains items which will enable the reader to estimate the probable number of miles which will be worked under the block system at the end of the present year. These figures are explained in notes below. In a number of the automatic installations represented in this column, the work is nearly, or quite, completed, but the signals have not yet been put in use. The total of these items is 2,171 miles; adding the 29 miles of the C. N. O. & T. P. we have 2,200 miles; which will be increased by whatever mileage the Northern Pacific may put under the block system. Of this 2,200 miles about 479 miles comes under the head of automatic.

NOTES ON PROPOSED NEW SIGNALING.

The Atlantic Coast Line expected to have 169 miles of the second division, formerly the Plant system, ready for operation by the telegraph block system in January.

The Baltimore & Ohio intends the coming spring to install the telegraph block system between Grafton and Wheeling and Grafton and Parkersburg, both double-track lines; total of the two, 203 miles.

The Central of New Jersey intends to equip 49.6 miles of double-track with automatic block signals.

The Cincinnati, New Orleans & Texas Pacific (all single-track) has its main line already equipped throughout, except for 29 miles. Of this 29 miles, all except certain portions in yards, will be equipped with automatic block signals this year.

The Chicago, Milwaukee & St. Paul will put the telegraph block system in force on 198 miles of single-track, and will put up automatic block signals on 56 miles of double-track.

The Lake Shore & Michigan Southern is having Hall automatic gas signals put in on the 40 miles of double-track between Buffalo and Dunkirk.

The Long Island Railroad will erect automatic signals on 20 miles of double-track and on seven miles additional of double-track now worked by the telegraph block system.

The Northern Pacific is adopting the telegraph block on its main line, but we have not received official figures as to the number of miles.

The New York, Ontario & Western intends to have eight or ten miles of single-track road equipped with automatic signals this year. These signals will fill in short gaps between sections of road already signaled.

The Pennsylvania road has automatic signals now under construction for 39.7 miles of four-track line, and during this year intends to equip at least 100 miles of road with automatic signals. Some of this line is two-track and some is four-track. This refers, we suppose, to lines which are now worked by the telegraph block system.

On the Pennsylvania Lines West of Pittsburgh the proposed additions this year are: Automatic, double-track seven miles, four-track three miles; telegraph block, double-track, 538 miles.

The Pittsburgh & Lake Erie expects to put up automatic signals this year on 35 miles of road.

The St. Louis & San Francisco intends to equip with automatic signals the line between Joplin and Oklahoma City, two miles, single-track, and between St. Louis and Windsor Springs, 12 miles, double-track.

The Southern Pacific will put in automatic signals between San Jose and Logan and at two other points, the three aggregating 3.5 miles, single-track; double-track at Oakland, at Port Costa and at San Francisco shops, aggregating 6.5 miles. The telegraph block will be introduced between Benicia and Sacramento, 57 miles, single-track. The automatic signals at Oakland and Port Costa will displace manual block signals.

The Wabash road, writing December 22, reported as ready for operation the lines between Bement and Chicago, 140.8 miles; St. Louis and Brunswick, 187.1 miles; and New Haven and Toledo, 88.5 miles; total miles ready for operation, 416.4.

The Telephone on the C. St. P. M. & O.

Superintendent of Telegraph H. C. Hope, of the Chicago, St. Paul, Minneapolis & Omaha, is experimenting with Graef's telephone, an apparatus for providing telephonic communication between a telegraph office and any point along a telegraph line, where a train or car (equipped with suitable apparatus) may be caught in an emergency and desire to communicate with headquarters; and one day last week a party of railroad officers, of St. Paul and vicinity, took a trip over the road between St. Paul and Eau Claire in a special train to witness the work of the device.

Mr. Graef's arrangement, which, we are informed, was patented last September, is very simple. It is not necessary to climb a pole or cut a wire; he makes connection from the car to the serial line by means of a

	Automatic.			Manual.			Total.	Proposed.
	Single track.	Double track.	Four track.	Single track.	Double track.	Four track.		
Atchison, Topeka & Santa Fe ^a	3.0	21.0	...	968.0	72.0	...	1064.0	
Atlanta & West Point—jointly with C. of Ga.	55.0	...	...	38.2	6.0	...	60	
Atlantic City	...	...	...	134.0	...	...	193.2	
Atlantic Coast Line	2.5	96.6	...	151.0	485.6	0.9	736.8	203
Baltimore & Ohio	...	...	...	145.6	6.0	2.3	147	
Baltimore & Ohio Southwestern	160.0	16.0	...	...	...	...	176.0	
Bessemer & Lake Erie	93.5	2.2	...	111.7	...	...	208.9	
Boston & Albany ¹	120.0	32.0	...	64.0	...	...	64.0	
Boston & Maine ²	...	...	...	870.9	149.4	...	1020.3	
Central of Georgia ³	269.0	44.7	...	518.8	81.8	...	914.3	
Chicago, Burlington & Quincy	...	4.0	6.0	150.0	200.0	...	360.0	
Chicago & Eastern Illinois ⁴	8.0	...	...	604.0	113.0	...	725.0	
Chicago, Milwaukee & St. Paul	2.0	21.5	...	2246.0	318.0	...	2587.5	254
Chicago & North Western	256.0	...	...	861.3	504.7	...	1622.0	
Chicago Terminal Transfer R. R.	0.6	5.0	...	...	...	...	5.6	
Chicago, Rock Island & Pacific	...	15.0	...	...	...	...	15.0	
Chicago & Western Indiana	...	...	...	19.8	...	...	19.8	
Chicago, St. Paul, Minneapolis & Omaha	3.5	1.1	...	415.6	20.2	...	440.4	
Cincinnati, Hamilton & Dayton	...	...	...	25.0	...	...	25.0	
Cincinnati, New Orleans & Texas Pacific ⁵	306.0	...	...	654	...	...	306.0	
Cleveland, Cincinnati, Chicago & St. Louis	5.3	33.2	...	...	...	...	35.5	
Delaware, Lackawanna & Western ⁶	4.7	193.1	...	750.0	...	...	947.8	
Erie & Wyoming Valley	2.0	...	...	775.3	630.7	11.8	1417.8	
Hannibal & St. Joseph	...	...	...	6.0	...	...	6.0	
Illinois Central ⁷	...	...	...	...	...	...	91.0	65
Kansas City, F. S. & M. (See St. Louis & S. F.)	...	...	...	7.4	2.0	...	9.4	
Kentucky & Indiana Bridge & Railroad Co.	40.0	...	...	500.0	917.8	...	1457.8	40
Lake Shore & Michigan Southern	429.4	...	...	578.6	69.6	...	1117.6	
Long Island	7.9	...	...	6.5	32.5	...	46.9	20
Los Angeles Terminal	2.0	...	...	...	...	...	2.0	
Metropolitan West Side Elevated, Chicago	1.0	2.0	...	20.0	...	...	3.0	
Michigan Central ⁸	280.0	...	...	10.0	232.0	...	522.0	
Mobile & Ohio	...	...	...	4.4	5.6	...	10.0	
Nashville, Chattanooga & St. Louis	72.9	12.5	...	1157.0	480.4	284.8	2007.6	
New York Central & Hudson River ⁹	189.5	...	...	37.7	15.6	...	242.8	
New York, New Haven & Hartford ¹⁰ , Eastern District	62.0	...	...	131.5	58.8	...	445.5	
New York, New Haven & Hartford ¹⁰ , Western District	72.0	...	...	...	...	...	72.0	10
New York, Ontario & Western	...	...	...	...	...	...	...
New York, Susquehanna & Western (See Erie)	2.0	...	...	361.7	68.1	...	431.8	
Northern Central (Included in P. R. R.)	...	...	...	...	...	...	...
Northern Pacific	...	...	...	1.5	3.2	...	4.7	
Ohio River Bridge	23.0	...	...	...	...	...	23.0	
Oregon Short Line	4.2	77.2	124.5	175.2	550.6	147.5	1079.2	140
Pennsylvania ¹¹	3.0	3.0	...	57.9	57.9	...	60.9	
Pennsylvania Lines West of Pittsburgh ¹²	2.0	10.0	24.0	398.0	33.0	437.0	548	
Pearl & Pekin Union	...	...	...	6.4	6.4	...	12.8	
Philadelphia & Reading ¹³	14.2	275.0	2.7	103.8	116.0	...	512.6	
Philadelphia & Reading, three-track line, equal to	11.2	11.2	...	...	...	...	11.2	
Philadelphia, Baltimore & Washington (Incl. in P. R. R.)	54.3	11.7	...	23.7	67.2	...	156.9	35
Pittsburgh & Lake Erie	...	...	...	110.2	3.8	...	114.0	
Richmond, Fredericksburg & Potomac (Incl. Wash. South.)	...	...	...	7.0	...	...	7.0	
Rio Grande Western ¹⁴	...	...	...	97.0	32.0	...	131.0	
South Side Elevated, Chicago	8.7	...	...	...	...	...	8.7	
Southern Railway ¹⁵	2.0	...	...	5935.0	...	...	5935.0	
Southern Pacific	80.5	16.0	...	120.0	26.0	...	242.5	67
St. Louis, Keokuk & Northwestern	16.0	...	...	...	...	...	16.0	
St. Louis & San Francisco	4.0	...	...	77.7	...	...	81.7	14
Terminal Railroad Association of St. Louis	...	...	...	...	12.0	...	12.0	
State Island Rapid Transit	8.7	...	...	...	...	...	8.7	
Union Pacific	15.0	...	...	453.7	23.0	...	476.7	416
Wabash Railroad	...	...	...	6.1	...	...	6.1	
West Jersey & Seashore (Included in P. R. R.)	...	...	...	...	...	...	...
Wisconsin Central	...	...	...	...	...	...	...
Total	875.2	2691.4	233.6	19,360.3	6029.6	524.7	29,733.7	...

NOTES ON THE TABLE.

^a On the Atchison, Topeka & Santa Fe, 31 miles, of the 968 miles of manual block on single track, is "controlled manual," being worked by the electric train staff. The staff is also to be introduced on the 9.8 miles between Lamy and Glorieta, N. Mex.

¹ The automatic signals on the Boston & Albany are on the main line and the Brookline circuit. In some places on the main line, where the grade is steep, one of the two main tracks is signaled while the other is not; and the mileage of such sections is divided by two, to give the equivalent in double track.

² In the double-track automatic mileage of the Boston & Maine a length of 33 miles, where only one track is signaled, is counted as 16½ miles.

³ This includes six miles used jointly with the Atlanta & West Point, and six jointly with the Southern Railway.

⁴ Of the single-track mileage on the Chesapeake & Ohio 256 miles is manual controlled and seven miles is manual controlled by means of the electric staff.

⁵ In the single-track telegraph block on the Chicago & Alton there is included seven miles worked by the electric staff.

⁶ The Miller signals, on the Chicago & Eastern Illinois, which have been in course of construction for some months, are not yet in service.

⁷ A small part of the 306 miles, on the C. N. O. & T. P., is worked by the electric staff and not by automatic signals, but we do not know the exact mileage.

⁸ The new signaling proposed on the C. C. C. & St. L. is manual single track.

⁹ On the Delaware, Lackawanna & Western the 750 miles manual is part single track and part double; and the block signals are used only for passenger trains.

¹⁰ Forty-four miles of the Erie, including the four-track portion, is controlled manual.

¹¹ Of the 91 miles of the Illinois Central equipped with automatic signals, nearly all is double track; but there is a length of six miles four-track, four miles six-track, four miles eight-track and some single track.

¹² The manual block signals on the Michigan Central are ordinarily used

metallic rod, which looks like a jointed fish pole, and, by means of a ground connection, establishes a telephonic current in one direction or the other without making a loop in the wire and without interrupting the telegraphic circuit. The apparatus in the telegraph offices is arranged in the well-known manner already familiar to the reader.

The outer end of the rod by which the connection is made is formed into a hook which supports the rod on the telegraph wire; and the telephone in the car or engine has positive and negative connections; and the first or the second of these is used according to whether it is desired to communicate west or east. By means of a magneto machine on the car, a current is sent which produces a buzzing sound in the telegraph relay at the offices on the line and the operator, understanding this as a telephone call, responds by means of the telephone in his office. In the experiments on the Omaha train the receiving telephone was so strong that the sounds received were audible in any part of the car.

Mr. Granel's apparatus is controlled by the National Telephone Company, and it is now used on the New York Central, the Buffalo, Rochester & Pittsburgh, and the Wheeling & Lake Erie.

Pratt Side Dumping Coal Car.

The accompanying engravings of the Pratt coal car show a design particularly adapted to the handling of coal or other bulk freight without a great amount of

for the top doors. The bottom door is kept closed by the fingers which extend down below the top of the side sill, when a flat key which is chained to the car is dropped down over the fingers and inside of the double brackets bolted to the sill. By removing this key the door swings open, due to the weight of the load and the contents discharge over the side. The door may then be swung up next to the top door and held by the trigger while the remaining portion of the load is pushed out through the opening next the floor instead of being thrown over the side as must be done with the ordinary drop bottom or flat bottom gondola. The top door may be dropped by releasing the catch on top the post and only a small part of the contents discharged automatically when so desired.

The end planks are stationary and fastened to the two corner posts besides having two end stakes bolted on the inside face of the end sill. A truss rod $\frac{3}{4}$ in. in diameter with a camber of $2\frac{1}{2}$ in. bolted to the corner posts half way up on the end planks relieves the side posts of the side thrust of the load. Very substantial wood underframing is used, there being eight longitudinal sills in all, $4\frac{3}{4}$ in. x $7\frac{3}{4}$ in., with the exception of the side sills, which are $11\frac{1}{4}$ in. deep tapered from the bolster to $8\frac{1}{2}$ in. at the end sill, which is $8\frac{1}{2}$ in. x 8 in. No sill pockets are used, the sills being mortised 2 in. deep with double tenons. Six $1\frac{1}{4}$ in. body truss rods are placed inside the outer sills, having a drop of 31 in. from the saddles over the bolsters to the queen posts, which bear on 13 in. x $4\frac{1}{2}$ in. needle beams,

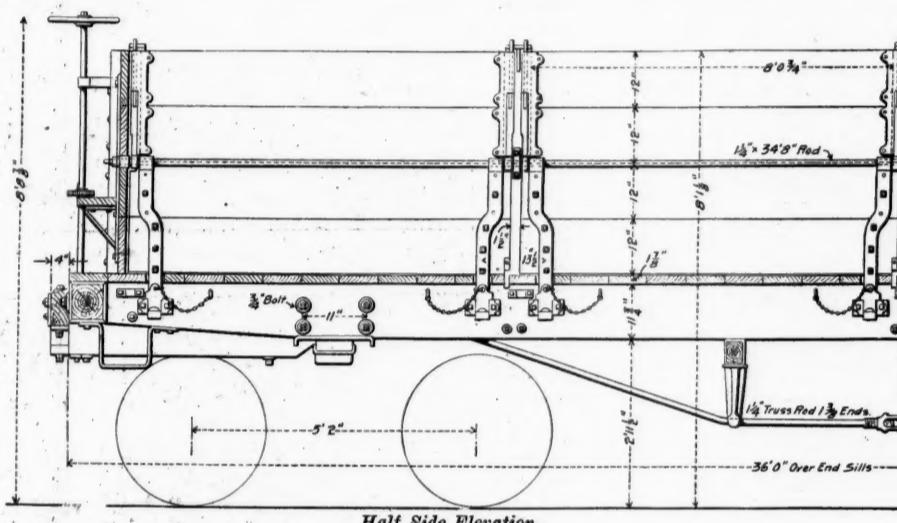
Western Railway controversy, and to the admirable indictment of the form of English railroad accounting by Mr. W. M. Aeworth—events that together mark an epoch of the greatest interest to the community—and to draw a moral therefrom.

"It is certainly astonishing to find a body of business men such as the directorate of the North-Western Railway permitting themselves to be led into the untenable position that they take up when they decline to meet the reasonable inquiries of a committee of their stockholders, and so promote by their very attitude a sense of distrust in the minds of the community.

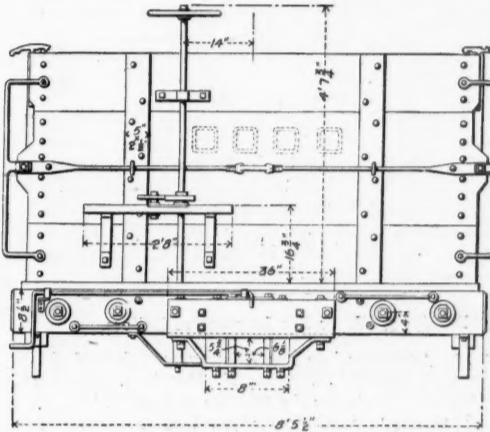
"Even less can be said for the official apologists of the railroad press, who should be above the use of petty argument, that it itself gives ground for doubt as to the entire wisdom and prudence of existing railroad methods and administration.

"In the same way it is also clear that the well-reasoned arguments of Mr. Aeworth, when he urges with the greatest moderation the need for more light, are meeting an opposition from established railroad authorities that argues a temper unfit to consider without bias the questions at issue, and still less to give a sound judgment upon them.

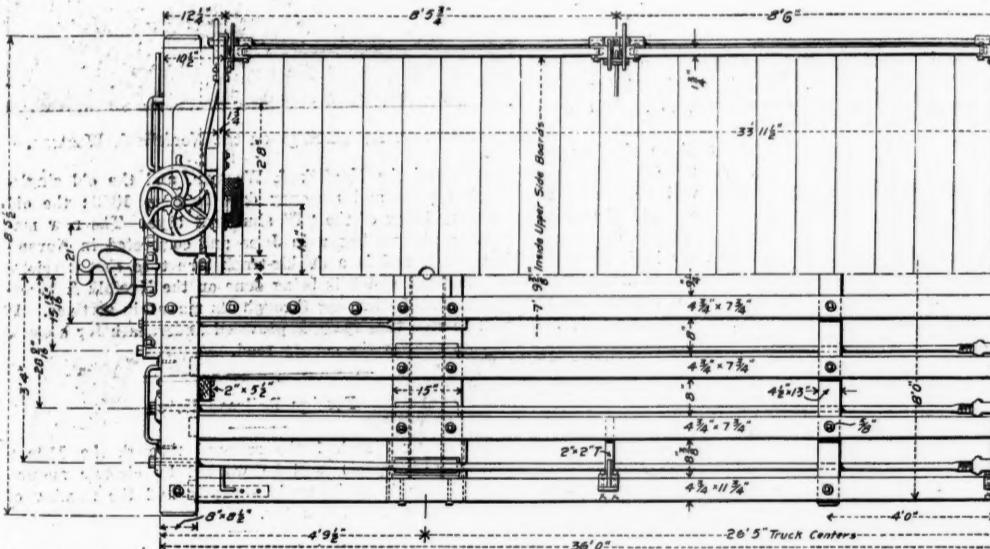
"Controversialists on the side of existing railroad policy should at least attempt to avoid the pettiness of the minor politician, and should understand the ground of the criticisms that are offered. Hitherto there has been a disposition to fix upon minute details of reform that may have been suggested, and upon them to turn a



Half Side Elevation.



End Elevation.



Half Plan and Underframing.

Pratt 60,000-lb. Side Dumping Coal Car—N. Y., N. H. & H.

labor at points where trestles and unloading bins and chutes for hopper cars are not found. A number of these cars have been built for the N. Y., N. H. & H. and other eastern roads whose business in this class of freight is largely confined to the distribution of comparatively small quantities of coal from the storage depots to numerous manufacturing plants and small dealers on their lines. While not entirely self clearing, a large percentage of the load is discharged by gravity on release of the doors and the remainder can be handled with minimum labor.

As will be seen from the drawings the sides of the car are divided into four sections 8 ft. $4\frac{1}{2}$ in. long, independent of each other in their operation. Each section is composed of a top and bottom door made of 12 in. x $1\frac{1}{4}$ in. planks, and these doors are hinged on the $1\frac{1}{4}$ in. rod which runs the entire length of the side. Heavy malleable iron posts bolted to the side sills and to the intermediate sills by means of a 2 in. x 2 in. T, extend up on the inside of the car through the floor at the end of the sections and take the place of the usual side stakes. The hinge rod is supported on these posts by brackets and on top are the triggers or catches

8 ft. apart. The draft timbers are $5\frac{1}{2}$ x $8\frac{1}{2}$, oak, bolted under the center sill and running back to the bolster.

Some of the general dimensions of the car are: Capacity, 60,000 lbs.; weight, 27,200 lbs.; length over end sills, 36 ft.; width over all, 8 ft. 10 in.; extreme height, 8 ft. 9 in.; inside length, 33 ft. $11\frac{1}{2}$ in.; inside width, 7 ft. 9 in.; height of side, 4 ft.

British Railroad Reform.

We have received from a railroad officer the following interesting contribution to the question of railroad reform. The officer has, we believe, not previously intervened in the discussion, and his remarks will consequently be read with the greater interest:

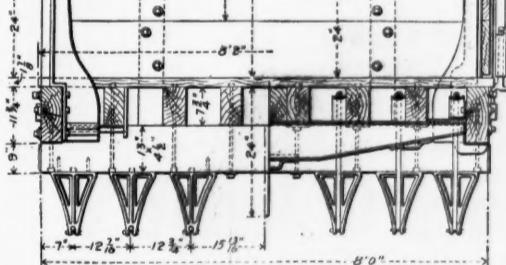
"It seems probable that, in spite of the very general discussion on the subject of railroad reform, the general public is not yet fully alive to the interest that all classes have in the bringing about of economical changes in English railroad administration. For this reason it may be permissible to call further attention to the North-

stream of scathing invective that is but little removed from abuse.

"What advantage," say they, "are railroads to derive from a knowledge of the number of tons carried one mile or the earnings per ton per mile that the roads may have carried?" And Mr. Aeworth, as representing the reformers, promptly answers that for ton miles or passenger miles, as such, he cares not a jot; but he does care for the atmosphere that a careful collection of such information will produce—an atmosphere in which alone the fine flower of progress in the business that is perhaps the most vital to the welfare of the nation will bloom and flourish.

"The unbiased railroad mind may well be asked to consider whether, after all, the attitude of self-satisfaction, that often takes the form of ridicule, is one that befits the subject, and whether the scientific training, that can alone prepare an individual for the great business of transportation, permits a departure from the humbler mental attitude that is at least ready to inquire.

"And it may be fairly asked, in this connection, whether the question of fundamental training for railroad officers



Cross Section.

has not some bearing upon the questions that are agitating railroads to-day.

"Of all the countries that have established railroad business as a definite career for the individual, it cannot be overlooked that Great Britain alone has provided no standard of education to fit him therefor. As a general rule, the administrative control of railroads in this country has for long been in the hands of men whose training and experience have been purely commercial, while the demands upon the character and ability of railroad officers are more and more those that a scientific training alone can supply.

"Some hope may be derived from the publicly expressed view of such men as Lord Allerton and Mr. Gibb that changes are desirable; and from these expressions railroad managers might take heart of grace, and give assurances that definite steps will be taken in this direction.

"The attitude of the average managerial mind in this matter is not, perhaps, altogether a matter of surprise, if its environment and conditions of existence are taken into account. Changes that involve very considerable personal effort and inconvenience are naturally abhorrent to the minds of men already overburdened with detail.

"Two courses are open to the administration that is convinced of the necessity for reform. Either there must be a considerable addition of staff at somewhat large cost, or a recasting of the organization. The first course not unnaturally condemns itself, and serves as the readiest weapon of defence; the second would certainly involve a long and difficult contest with the passive resistance of a large staff whose pay and employment are not dependent upon results, and whose appointment, come good times or bad, is practically secured during good behavior. To such a body changes of method do not readily appeal, and until the general railroad mind can be convinced that the good of the general public means the good of railroad enterprise, and therefore of railroad staff, changes will certainly be fraught with difficulty.

"In this direction, as in so many others, investigation, fuller knowledge, and real education is the key to success; and in this direction it is certain that railroad administrations must proceed."—*The Statist.*

Purifying Water For Locomotive Boilers.

In a paper presented to the February meeting of the Western Railway Club, Mr. G. M. Davidson, Chemist and Engineer of Tests for the Chicago & North Western, described the system of water purification for boiler purposes in use on that system.

It was said that on the North Western would be found supplies of the best and of the worst water for

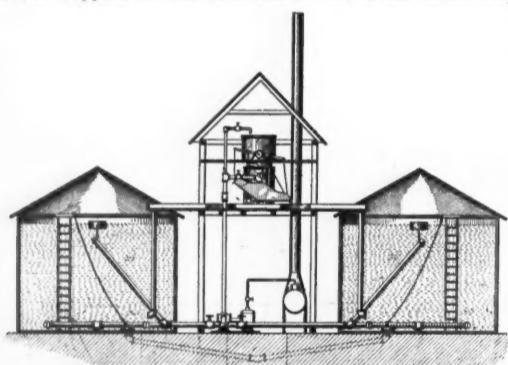


Fig. 1.—Section Through Pump House and Settling Tanks.

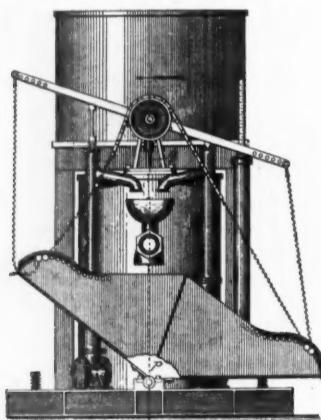


Fig. 2.

Treating Apparatus—Chicago & North Western Purifying Plant.

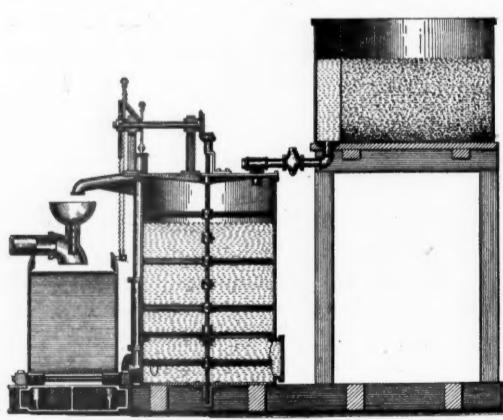


Fig. 3.

locomotive boilers. For instance, at Cedar Lake, Wis., there is a well supply containing only 1.87 grains of solid matter per gallon, of which 1.07 grains is incrusting solids. The amount of solid matter for 1,000 gals. is .15 lbs. Lake Michigan water is considered as good as any that they use in large quantities, and this has 7.78 gr. of solid matter per gallon. In Iowa the water is bad, well water giving 53.67 gr. solid matter, of which 46.88 gr. is incrusting solids. Minnesota and Dakota have the worst water of all. For three different stations

point are also obliged to take untreated water at other points, so that any good results from the use of the treated water are to a large extent neutralized by the other. But four switch engines in constant use there and using none other than treated water have shown excellent results. Only one-quarter of the boiler work has been done on them as was done in any similar period previous to using the treated water; and all old scale is loosening up and rapidly being removed.

It costs much more to remove sulphates than carbon-

ates, the proportion being something like 9 to 1. On the North-Western the cost of water treatment ranges from a minimum of 1 cent per 1,000 gals. for a not very bad water, to a maximum of 10 cents for a water which would be unusable without treatment.

In a diagram which showed graphically the character of boiler water supply across the State of Iowa, the highest peaks, denoting the worst water, were found in the western part of the State. Study of a geological map of the State disclosed the fact that the northwest part is underlaid with cretaceous deposits, otherwise chalk and gypsum. The direction of the streams is such as to convey the water falling in this region southward, with the result that it is the water passing through and over these beds that forms the supply for this section of the road.

Colored drawings of the treating apparatus adopted on the North-Western were exhibited and explained. The plant consists of two large settling tanks with a pump house between. This pump house is a two-story affair (Fig. 1), the upper story of which contains the treating apparatus. The reagents are saturated solutions of lime and soda ash. In front of the reagent tank is a peculiar shaped receptacle called a "tipper," shown in Figs. 2 and 3. The discharge line from the pump empties into this tipper, which is divided into two compartments, each of which will hold something over 100 gals. The tipper is so balanced that when a predetermined amount of water has flowed into one compartment it will rock over, bringing the other compartment under the pump main.

It will also be seen from Fig. 2, that the tipper is connected to a chain at each end to a walking beam which operates the valves controlling the outlets from the reagent tank. Therefore the movement of the tipper causes it to be delivered to itself a predetermined charge of the chemical, which, as may be seen from Fig. 3, enters with the water and is therefore thoroughly mixed with the latter. The amount of the charge may be regulated by the degree of slackness of the chains. While one compartment is filling, the other is emptying into one of the settling tanks.

It will further be seen from Fig. 2 that the tipper is also connected to a sprocket wheel on a horizontal shaft, which is geared to a vertical shaft in the reagent tank; the latter shaft is provided with horizontal arms, or paddles. Each movement of the tipper revolves this shaft $1\frac{1}{2}$ revs., keeping the reagent thoroughly stirred. It will be seen from the various operations controlled by the tipper that it is at once a meter, motor and mixer.

Each of the settling tanks has in it a large float to which a pipe connected to the pump suction is attached so that water may be drawn from near the surface at all times. A tank filled with freshly treated water is agitated to cause thorough mixing of the ingredients by means of a pipe connected to the pump discharge line and running across the bottom of the tank. (Fig. 1.) This pipe has a number of holes drilled in it from which the water, under pressure, issues in jets, stirring up the contents of the tank. In this way the pump simply circulates the tank contents. This is continued for some 15 minutes, when the water is allowed to settle and is ready to be pumped to the road tank.

The North-Western now has six of these plants completed and 11 more are building. At the Chicago shops 25 machines are being built which will be placed as rapidly as possible. All machines are made the same size. The capacity of any plant is therefore dependent upon the capacity of the pump, up to the limit of working of the apparatus. A machine is capable of handling 77,000 gals. of mixture (chemical and water) in 12 hours, and from this 60,000 gals. of soft water is obtained.

The first plant to be installed was at Council Bluffs, Iowa, July 30, 1902. The road engines handled at that

time the proportion being something like 9 to 1. On the North-Western the cost of water treatment ranges from a minimum of 1 cent per 1,000 gals. for a not very bad water, to a maximum of 10 cents for a water which would be unusable without treatment.

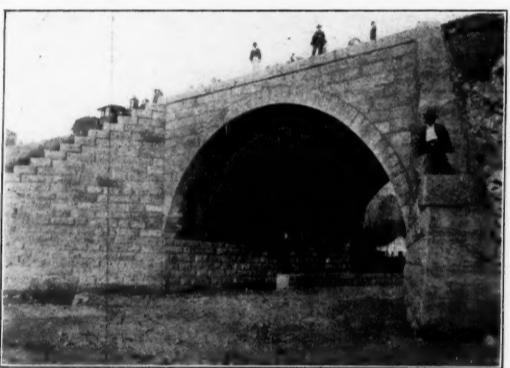
The disposal of the sludge has been a problem where the plant is not convenient to a drain. One plan tried is to run it into a large hole in the ground and to remove the sediment after drainage. Other plans such as pumping it into boxes or barrels on cars have been tried. This sludge, it was said, makes excellent material for whitewash, and has been used for that purpose quite extensively on the North-Western. It is of fine texture and entirely free from grit. Experiments are at present being conducted to determine its value as a component of boiler lagging.

Replacement of an Old Bridge.

The accompanying illustrations show an old single-track deck girder span over a mountain stream and county road on the west slope of Blueridge Mountain, Va., and the 50-ft. arch with which it has been replaced. This is on



Deck Girder Bridge on the N. & W., Built in 1856.



New Stone Arch Bridge on the Norfolk & Western.

the line of the Norfolk & Western, and the old single-track girders and masonry date back to 1856; the old masonry being of the "T" abutment type. The new masonry arch was begun in June and completed in November, 1902, and is a double-track structure characteristic of the work which is being done on the Norfolk & Western in double-tracking through its mountain sections. It will be seen that space is provided underneath for a small stream and for the county road.

Foreign Railroad Notes.

Beginning March 1 the railroad through the Mersey tunnel (Liverpool) will be worked by electric motors. The change is to be made abruptly and the number of trains run will be 750 a day.

The Great Central Railway has made some experiments with the Miller cab signal near the Woodhead tunnel.

English railroads will place in commission during the coming summer two turbine steamers. One is for the South Eastern & Chatham for the Dover-Calais service, which is to traverse the 20 miles from port to port in 40 minutes; and the other is for the Newhaven-Dieppe service of the London, Brighton & South Coast; this is to cover the 60 miles of open sea in but little over two hours.

Trip of Inspection—Purdue University.

The annual trip of engineering students of Purdue University will begin Wednesday, April 15, and end Saturday, April 18. The trip this year, as for several years past, will be made to the city of Chicago. The headquarters for the party will be the Victoria Hotel. Among the places of interest to be visited are the shops of the Pullman Palace Car Company, the Western Electric Company, Chicago, and the Chicago & North Western Railway; the Illinois Central Terminals, Chicago River bridges, the elevated railroads, and the Illinois Steel Works; the Gates Iron Works, and the Chicago drainage canal.

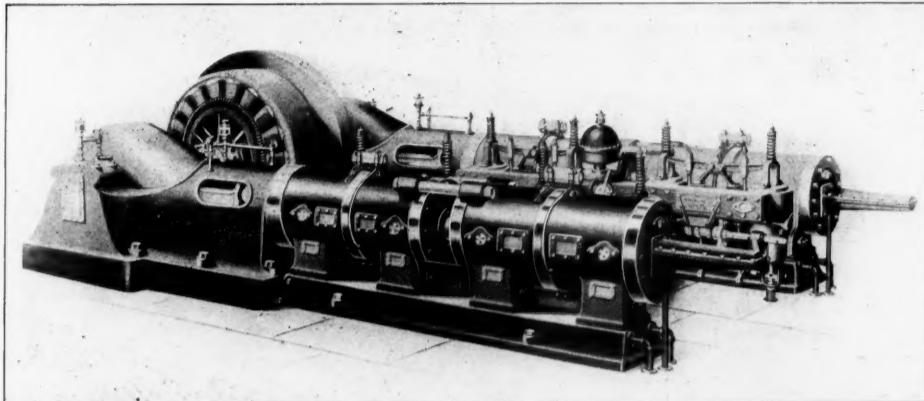
A New Double-Acting Tandem Gas Engine.

The engraving shows a 1,500 horse-power double-acting tandem cylinder internal combustion engine which the Westinghouse Machine Company has been developing. Similar designs up to 3,000 h.p. have been planned. They work on the four stroke cycle and the periods of admission are arranged so that two impulses occur each revolution in the single crank engine and four impulses every revolution in the two crank engine. The supply of combustible is always of the same strength whatever may be the load. As the load upon the engine increases or decreases a corresponding greater or less quantity of mixture of gas and air is drawn into the cylinders. That this method is more economical than others is confirmed

stance of the use of the gas power apparatus is by the Potosina Electric Company, Mexico. The plant will contain five units aggregating 1,225 h.p., and will use gas made by the Loomis-Pettibone process containing about 120 B. T. U. per cubic foot.

An Engineer Should Know Bookkeeping.

Mr. Alexander C. Humphreys, in *Cassier's Magazine*, invites attention to the value to an engineer of business training. His specific recommendation is good, and is as follows: . . . We cannot expect to train the students to be expert bookkeepers, nor is it necessary to do so; but we can expect to give them what is of more value and

**Double-Acting Tandem Gas Engine.**

by the fact that several European builders have abandoned the variable for the constant mixture.

The construction is in many respects unique in that it departs materially from the accepted European design and embodies established features of modern steam engine practice. The cylinders are double walled, with the outer walls split peripherally to permit independent expansion and contraction without placing the cylinder casting under stress. The two cylinders are united at the top by heavy tie rods, engaging peripheral bosses, and at the bottom by a stout cast-iron distance piece. The rear section of the bed-plate which supports the two cylinders is cored hollow with a central dividing wall, and serves as a reservoir for incoming and outgoing circulating water. All connections are piped directly to these reservoirs, this avoiding a large amount of piping about the engine. Through the bed-plate extend the four vertical exhaust pipes, which connect below with an exhaust main. The exhaust passages leading from the valve chambers are cast integral with the cylinders, upon their under sides, and are water cooled.

At the ends of each cylinder occur horizontal side ports, resembling straight steam ports, which communicate with removable combustion chambers. The cylinders are closed by water jacketed heads, those located between the two cylinders being split diametrically for facilitating inspection, and the two halves are united with a ground fit, no packing being found necessary. The combustion chambers are independent castings, with plain machined faces, circular valve-liner seats, and cored out passages for circulating water. Both admission and exhaust valves, which are of the standard poppet type, operate vertically and with opposite throw. They open by cam movement, and are held to their seats by spring pressure. The central space, closed by the admission valve above, and the exhaust valve below, communicates directly with the cylinder port.

The supply pipe is a rectangular cast-iron main extending along the entire front and provided with openings opposite each admission valve. It receives its supply from the governor chamber midway between the two ends, this in turn communicating with a mixing chamber. Each valve, together with its spindle and seating spring, is independently mounted, and by removing the bolts from the bonnet, the entire valve, seat and liner may be drawn out for inspection or replacement. The igniters are the "make and break" type. The valve gear is the Westinghouse standard cam and roller pattern.

The cooling water enters the cross-head by means of a flexible pipe connection and flows through the hollow piston rod to the front and rear pistons, emerging through a bronze tail rod extending through the rear head. Similarly, cold water passes through the cylinder jackets, thence to the jackets surrounding the exhaust valves and ports, and finally to the return pipe, emerging at a sufficiently high temperature for use in heating and drying coils, radiators, etc.

The engine is started by compressed air pumped into a steel reservoir. A special disengaging gear is provided which allows the rear cylinder to operate as an air motor until the regular combustion cycle is taken up in the forward cylinder.

The engine is governed by a sensitive fly ball governor which operates a vertical piston valve.

The single crank engine is at present made in sizes ranging from 250 to 750 h.p., and the double crank from 750 to 1,500 h.p. In the latter, cranks are placed at 90 deg. The first installation to be put into operation will be at the works of the Consolidated Industries Company, Batavia, N. Y., which was briefly described in the *Railroad Gazette* of Nov. 14, 1902. A more recent in-

what many bookkeepers do not possess—a sound knowledge of the principles of double-entry bookkeeping. This knowledge engineers need to enable them to exercise a close, intelligent, and independent supervision of manufacturing cost.

The students should be taught to carefully and conscientiously discriminate between the charges to capital or revenue, and they should be warned of the ease with which errors can be made in this connection and the disastrous consequences likely to follow their commission. They should also be shown the necessity for making adequate provision for depreciation of plant, the scheme to be based upon an exhaustive analysis of local conditions and not upon the blind acceptance of arbitrary rules formulated by accountants. They should be shown that books can be so kept, either through ignorance or design, as to hide the facts and to present a warrant for the payment of dividends unearned. They should be shown that all this, and much more, they will need if they are to be competent as managers or reliable as advisors in connection with the purchase of properties.

The Sacred Bridge at Nikko.

After the Campanile of Venice, the Sacred Bridge of Nikko! A typhoon that occurred in the latter part of last year in Japan caused much damage to property, but no damage that, in the eyes of a true Japanese, can be compared to the loss of this ancient relic. It was known as the Red Bridge, or Mi-hashi, being made

of wood coated all over with red lacquer, and was formerly so sacred that it was closed to all persons except the Shogun, save twice a year when it was opened to pilgrims. It was built at the spot where the Buddhist saint, Shodo Shonin, a hermit who lived at Nikko in the eighth century, crossed the Daiya-gawa on a bridge consisting of two green and blue snakes thrown there by the divinity who had once helped the Chinese pilgrim Hsian Chuang across the River of Flowing Sand.

It was supported—the Mi-hashi that is; not St. Shonin's snake-bridge—on stone piers of great solidity fixed into the rocks between which the stream flows, and its color formed a beautiful and striking contrast to the deep green background of cryptomeria. It was 84 ft. long and 18 ft. wide; was built in 1638 and last repaired in 1892. At each end were gates that were always kept closed, and a Russian Prince who visited Nikko some time ago wounded the feelings of the people very much by rudely insisting on traversing it. Like the Campanile at Venice, it showed signs of decay some time ago—so at least folks say now that it is gone. At all events its end was glorious, for it was swept away by the most disastrous storm that visited Japan for the last 26 years. In fact, the waters of the Daiya-gawa are said to have risen higher than they have risen for the last 300 years, and 300 persons perished in the copper mine at Ashio, near Nikko, and more than 200 houses, including several temples and hotels as well as a town hall, were swept away in Nikko itself.

Train Accidents in the United States in January.¹

xc, 1st, Pennsylvania road, New Haven, Pa., collision between a passenger train and a switching freight train; several cars damaged, five passengers injured.

1st, Northern Pacific, Schultzer Spur, Mont., a freight train was derailed, apparently by the displacement of a switch by machinery (on a platform car) which protruded at the side as the train passed (in consequence of the breaking of one of the stakes of the car). Two cars were ditched and a tramp was killed. Two other tramps were injured.

bc, 2d, 11 p.m., Rutland road, Shelburne, Vt., butting collision between a northbound passenger train and a southbound empty engine, wrecking both engines, the boiler of one of which exploded. Both engineers and both firemen were killed and a brakeman riding on the empty engine was fatally injured. Several other employees on the passenger train were injured.

xc, 2d, Great Northern, Minneapolis, Minn., collision of switching freight engines; one engineer killed.

xc, 3d, 5 a.m., New York, Chicago & St. Louis, Avonia, Pa., a freight train switching on the main track was run into by a westbound freight running at high speed and the westbound engine and several cars were wrecked. One engineer was killed and one brakeman was injured.

xc, 3d, Wilmington, Del., a freight of the Philadelphia, Baltimore & Washington ran into a freight of the Philadelphia & Reading at a crossing, and five employees were injured. There was a dense fog at the time.

unx, 3d, Ohio Central, Mermill, Ohio, the baggage car of passenger train No. 6 was derailed, while running at full speed, and fell against a platform car standing on a side track. Both these cars were wrecked and were pushed against a dwelling house, damaging it badly. The baggageman was injured.

o, 3d, Norfolk & Western, Bedford, Va., the locomotive of passenger train No. 4 was wrecked by the explosion of its boiler, and the engineer and fireman were killed. The express car was overturned and six passenger cars were derailed. One trainman and a brakeman were injured.

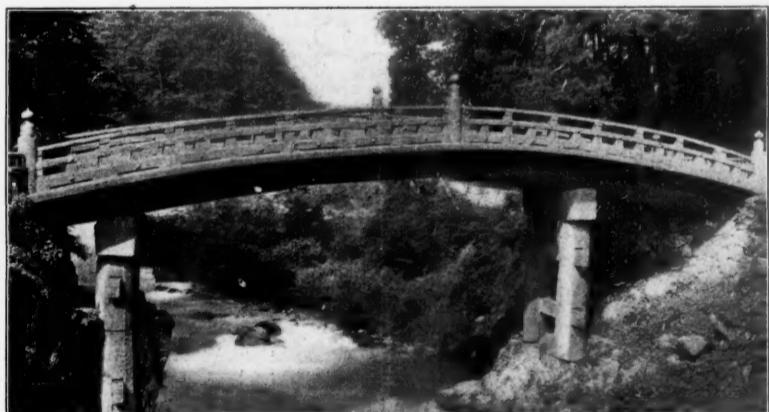
unf, 3d, 10 p.m., Southern Railway, Weems, Ala., passenger train No. 37 was derailed and the engine and four cars were overturned. The engine and baggage car were wrecked. The engineer was killed and 20 passengers and three trainmen were injured. It is said that the derailment was due to the loosening of the rails by the wheels of a derailed car in a freight train which had passed over the track shortly before, cutting off the heads of some of the spikes.

*xc, 7th, Pennsylvania road, Cochran, Pa., passenger train No. 14 collided with the rear car of a freight train which had almost, but not quite, cleared the main track, and the first passenger car (a smoker and baggage car combined) was wrecked. Three passengers and five employees were killed and four passengers and one employee were injured. The tender of the passenger locomotive took the worst part of the shock of the collision, and the tank was forced from its floor back through the combination car and to within three feet of the rear door. All of the victims were in this car. The baggage car was heated by a stove, and from this stove the wreck took fire and some of the injured persons were burnt. Oil in the lamps in this car intensified the fire. It appears that the freight train, though on the time of the passenger train, was not properly protected.

xc, 7th, Pennsylvania road, Centerville, Pa., a freight train collided with a string of empty cars, making a bad wreck. One brakeman was killed and two other trainmen were injured.

dn, 7th, Seaboard Air Line, Ochwalkee, Ga., a freight train ran into an open draw, and the engine and two cars fell into the Oconee River. A brakeman was injured.

*rc, 8th, 5 p.m., Pittsburgh, Fort Wayne & Chicago, Ada, Ohio, passenger train No. 35, which had stopped at Gilbert street, a short distance west of the station, was run into at the rear by a following express train, No. 19, wrecking the two passenger cars on train No. 35. Three employees riding as passengers were killed; five other passengers were seriously injured and nine slightly hurt. A corner of one of the coaches projected slightly over the eastbound track, and a few minutes

**The Sacred Bridge at Nikko.**

after the collision caught the cab of the engine of an eastward passenger train, running at high speed, slightly damaging it. There was a driving snow storm at the time, and the engineer of No. 19 did not see the signal

¹Accidents in which injuries are few or slight and the money loss is apparently small, will as a rule be omitted from this list. The official accident record published by the Interstate Commerce Commission quarterly is regularly reprinted in the *Railroad Gazette*. The classification of the accidents in the present list is indicated by the use of the following

ABBREVIATIONS.

rc Rear collisions.

bc Butting collisions.

xc Miscellaneous collisions.

dr Derailments; defect of roadway.

eq Derailments; defect of equipment.

dn Derailments; negligence in operating.

unf Derailments; unforeseen obstruction.

unx Derailments; unexplained.

o Miscellaneous accidents.

An asterisk at the beginning of a paragraph indicates a wreck wholly or partly destroyed by fire; a dagger indicates an accident causing the death of one or more passengers.

that was sent back from train No. 35. At the entrance to the block section in which the accident occurred, train No. 19 received a caution signal. The cause of the stoppage of No. 35 was the pulling of the automatic cord by some unknown person.

bc, 8th, Baltimore & Ohio, Glovers Gap, W. Va., butting collision of freight trains, damaging both engines and several cars; three trainmen injured.

9th, 10 p.m., Cleveland, Cincinnati, Chicago & St. Louis, Bethalto, Ill., butting collision of passenger trains, wrecking both engines and several cars. The fireman of the westbound train was killed and one engineman was fatally injured. One of the cars took fire from an over-turned stove and was badly damaged.

unx, 9th, Terminal Railroad Association line, St. Louis, Mo., eastbound train No. 2 of the Vandalia Line was derailed at the south entrance of the tunnel approaching Eads Bridge, and the engine was badly damaged. The fireman was fatally scalded and the engineman was injured.

bc, 11th, Union Pacific, Harper's, Wyo., butting collision of freight trains; one fireman and two other trainmen injured. It is said that a stop signal was displayed at Harper's station for the westbound train, the operator there having an order fixing Harper's as the meeting point for the two trains; but there was a blinding snow storm and the engineman did not see the signal. The engineman was making his first trip over this division of the road. Mrs. Fredericks, the operator at Harper's, tried to stop the train by using a fusee, and she succeeded in attracting the attention of the conductor, who, as soon as possible, set the air-brakes, but not quite soon enough to prevent the collision.

xc, 11th, 4 a.m., Southern Railway, Columbia, S. C., collision between a freight train and a switching engine, wrecking both engines and several cars. Two trainmen were injured.

*rc, 12th, Boston & Maine, Erving, Mass., an eastbound freight train standing at a water tank was run into at the rear by a following passenger train, and the engine and caboose were wrecked. The caboose and one freight car took fire and were burnt up. The rear brakeman of the freight, who had just been back with a flag and had returned to his caboose, was killed.

o, 12th, St. Louis & San Francisco, Memphis, Tenn., a freight locomotive was wrecked by the explosion of its boiler and four employees were injured.

dr, 13th, Chicago, Burlington & Quincy, Upper Alton, Ill., a passenger train was derailed by a broken rail and the engine was overturned and fell down a bank. The engineman was killed and four other trainmen were injured.

rc, 14th, 1 a.m., Southern Pacific, Sour Lake, Texas, a freight train standing at the station taking water was run into at the rear by a following freight, and the engine and several cars were wrecked. Four employees were killed and two injured. There was a dense fog at the time, and it is said that the second train was running at 20 miles an hour when it struck the one ahead of it.

xc, 14th, Great Northern, Barnesville, Minn., passenger train No. 4 ran into a freight train which was switching on the main track, and both engines were badly damaged. One engineman and one fireman were injured.

xc, 14th, Union Railway, Indianapolis, Ind., collision between a locomotive and a switching freight train; one trainman fatally injured.

xc, 14th, 11 p.m., Boston & Maine, Cold River, N. H., collision of locomotives, making a bad wreck. One engineman was killed and one fireman was injured.

dr, 14th, Baltimore & Ohio, Bellaire, Ohio, a switching engine was derailed by a loose rail and one trainman was injured.

xc, 15th, New York, New Haven & Hartford, West Barnstable, Mass., a freight train broke in two and the rear portion afterward ran into the forward one, wrecking several cars. Four trainmen were injured.

unx, 15th, 11 p.m., Central of New Jersey, Jersey City, N. J., a car in a freight train was derailed and overturned, and a brakeman was killed.

rc, 16th, 4 a.m., Baltimore & Ohio, Cumberland, Md., passenger train No. 10, drawn by two engines, collided with two empty engines coupled together, which had been stopped in consequence of delay to a freight train backing off in the yard. Two enginemans and two firemen were killed and one fireman was slightly injured. The two passenger engines were badly damaged but the freight engines, with the exception of the tank of one of them, suffered no material damage. The collision was due to the wrongful giving of a clear signal at the entrance of the block section. While the signalman was preparing to give a permissive order to the passenger train, and while his back was turned to his signal levers, a 16-year-old boy, a messenger employed by the company, cleared the signal without authority.

unf, 16th, Denver & Rio Grande, Gunnison, Colo., passenger train No. 371 was derailed and all of the cars were ditched; 30 passengers were injured. It is said that the derailment was due to the loosening of the rails by a derailed car which had passed over the track about five hours previously.

o, 17th, 8 p.m., New York Central & Hudson River, Chastleton, N. Y., the locomotive of a southbound freight train was wrecked by the explosion of its boiler and the engineman and fireman were killed.

o, 18th, Baltimore & Ohio, Monrovia, Md., the locomotive of a freight train was wrecked by the explosion of its boiler. The fireman and one other trainman were killed and two others were injured.

rc, 19th, 3 a.m., Illinois Central, Vera, Ill., rear collision of freight trains, one of which had been stopped for orders; 20 loaded cars were wrecked, the engineman was killed and two other trainmen were injured.

rc, 19th, Chicago, Burlington & Quincy, Plattsburgh, N.Y., rear collision of freight trains, wrecking the caboose and one car; one trainman killed.

unf, 19th, 2 p.m., Baltimore & Ohio, Claysville, Pa., passenger train No. 108 was derailed by running over a horse, and the engine and baggage car fell down a bank. The engineman was injured.

re, 20th, Great Northern, Chiawaukum, Wash., a freight train ran into the rear of a preceding rotary snow-plow train, making a bad wreck. In three cars in the front part of the freight train were 25 laborers, of whom 12 were killed and 11 injured.

du, 20th, Baltimore & Ohio, Parkersburg, W. Va., a passenger train was derailed at a misplaced switch and 10 passengers and two trainmen were injured.

o, 20th, Grand Trunk, Berlin Falls, N. H., the locomotive of a freight train was wrecked by the explosion of its boiler. The fireman and two other trainmen were injured, the fireman fatally.

o, 20th, 1:20 p.m., Pennsylvania Lines, Philadelphia Road, Ohio, the engine of an eastbound freight train exploded and the boiler was completely lifted from the frame, turned end over end, striking the north rail of the westbound track. It continued to rebound, turn-

ing over two times, and landed with the fire-box upward on the north side of the right of way 120 yds. from the point of explosion. At the time of the explosion a freight train was approaching from the east; and the boiler of the exploded engine either broke a rail of the westbound track or depressed the track to such an extent that, although the engine passed over the damaged track, 23 cars were derailed and fell down the bank. The wheels of the exploded engine all remained on the track, and its cars were not damaged. The engineman of the exploded engine was injured so that he died later, the front brakeman was instantly killed, and the front brakeman on the westbound train was injured so that he died two hours later.

xc, 21st, Southern California, Keenbrook, Cal., the forward engine of a double-header freight while running down Cajon grade was found to have a loose driving tire; the engine was detached and run ahead to a switch, but was derailed at the frog; the second engine was cut off and sent forward to ascertain what was the matter; while it was gone the air leaked off the 69 cars of the train, which ran down and collided with the two engines, killing two enginemans and fatally injuring another trainman. Both engines and several cars were wrecked.

unx, 21st, Denver & Rio Grande, Rifle, Colo., passenger train No. 3 was derailed at a curve, while traveling about 35 miles an hour. Reports state that no person was injured.

o, 21st, Chicago & North Western, Cheboygan, Mich., the engine of passenger train No. 3 was badly damaged by the breaking of the parallel rod. The train ran half a mile before it could be stopped, the engineman having been driven away from the cab. The fireman was badly injured.

rc, 22d, Southern Railway, Hickory, N. C., rear collision of freight trains, wrecking a caboose and several cars; engineman and fireman fatally injured.

*jdr, 22d, Chicago Great Western, South Freeport, Ill., a westbound passenger train was derailed by a broken rail and the engine was overturned. One passenger car was badly damaged and the baggage car was destroyed by fire. One passenger was killed by inhaling steam, and the engineman and fireman were instantly killed by the overturning of the locomotive.

dn, 22d, Denver & Rio Grande, Thistle Junction, Utah, a freight train became unmanageable on a steep grade and ran several miles at high speed and was finally derailed at a curve; 25 cars were wrecked.

unf, 22d, 1 a.m., St. Louis & San Francisco, South Greenfield, Mo., passenger train No. 104 was derailed by a switch which had been maliciously misplaced, and the entire train was ditched. The cars took fire and were mostly burnt up. The engineman was killed and the fireman and several passengers were injured. It is said that there had been two or three other attempts recently to wreck trains at or near this point.

22d, Phillips & Rangeley, Read River, Me., a snow-plow train consisting of three engines, a snow-plow and a flange scraper was derailed and wrecked, and three trainmen were badly scalded.

xc, 23d, 4 a.m., Illinois Central, Natalbany, La., a freight train, moving slowly, was run into at the rear by a following freight and the caboose and several cars were wrecked. A fireman was killed and two other trainmen were injured.

xc, 23d, Missouri Pacific, Yates Center, Kan., a coal train which had been delayed in entering a side track was run into by a passenger train and one engineman and one fireman were killed.

xc, 23d, 11 p.m., Union Pacific, Gothenburg, Neb., collision between passenger train No. 3 and a freight, badly damaging both engines and several cars. The passenger fireman was killed and one other man was injured.

xc, 23d, Chesapeake & Ohio, Louisville, Ky., collision of eastbound and westbound passenger trains, one of which was entering a side track. One engineman, one fireman and eight passengers were injured, the engine-man fatally.

dn, 23d, 1 a.m., Illinois Central, Memphis, Tenn., a southbound passenger train was derailed at a misplaced switch and the locomotive and seven cars were overturned. The engineman and fireman were fatally injured and three other trainmen less severely hurt.

unf, 23d, Colorado & Southern, Watervalle, N. Mex., passenger train No. 2, running at full speed, was derailed at a point where the rails had been maliciously loosened, and the engine and first two cars were overturned. Four trainmen were injured, two of them fatally.

23d, Missouri Pacific, Yates Center, Kan., a passenger train collided with a freight train, which was entering a side track, and the engine and several cars were wrecked. The engineman and fireman were killed.

unx, 23d, Gulf, Colorado & Santa Fe, Copperas Cove, Texas, an eastbound passenger train was derailed and three cars were ditched. Three passengers and one trainman were injured.

bc, 24th, Norfolk & Western, Stanley, Va., butting collision of freight trains, one of which was drawn by two engines. Two of the three engines fell through a trestle bridge. One engineman was killed and another fatally injured; three other trainmen were also hurt.

24th, Virginia & Southwestern, Bristol, Tenn., collision between a freight train and a switching engine; one trainman killed and one fatally injured.

rc, 25th, 4 a.m., Pennsylvania road, Wilmore, Pa., a westbound freight train which had been unexpectedly stopped was run into at the rear by a following freight, said to have received a caution signal; and one engine, a caboose and six cars were wrecked. The wreck fell against another freight train on the adjacent track, and cars in this train in turn fell against another freight train on an eastbound track, blocking the whole road for four hours.

unf, 25th, Oregon Railroad & Navigation Co., Birmingham Springs, an eastbound passenger train was derailed at a washout and the engine was overturned. The engineman and fireman were killed and one passenger was injured.

xc, 26th, Williamsport & North Branch, N. D., a freight train ran over a misplaced switch and collided with some cars on a side track, making a bad wreck. Six of the cars on the side track broke away and ran two miles down a steep grade, where they were derailed. Three trainmen were killed in the collision, and two were injured.

*26th, Norfolk & Western, Radford, Va., a passenger train ran into the rear of a preceding wrecking train. Two cars of the latter took fire and were burnt up. There was a dense fog at the time. One employee was injured.

re, 27th, Pittsburgh, Ft. Wayne & Chicago, Chicago, Ill., a work train ran into the rear of a preceding freight, wrecking the caboose and one car. Two drovers were injured, one of them probably fatally.

xc, 27th, Chicago & Eastern Illinois, Danville, Ill.,

collision between a passenger train and an empty engine; four trainmen injured, one of them fatally.

*tr, 27th, 6:30 p.m., Central of New Jersey, Westfield, N. J., a fast westbound express train ran into the rear of a preceding train which had been stopped by reason of a hot journal, and the last three cars of the standing train were completely wrecked, the speed of the express train being very high. Twenty-one passengers and one employee were killed and about 40 passengers and one employee were injured. The cars took fire and some of the passengers were burned to death. The engineman of the express allowed himself to become engaged in attending to a defective injector and ran past both fixed and hand signals displayed to stop him. This engineman was fatally injured. This collision was reported in the *Railroad Gazette* of Jan. 30 and Feb. 6.

ed, 27th, 11 p.m., Pennsylvania road, Asheton, Pa., a freight train was derailed by a broken axle and 15 cars of coal fell down a high bank into a river.

rc, 28th, Chicago & North Western, La. Fox, Ill., rear collision of live stock trains, wrecking the caboose. Four drovers in the caboose of the foremost train were killed and nine drovers and one trainman were injured. There was a dense fog at the time.

*jbc, 28th, 2:53 a.m., Southern Pacific, near Esmond, Ariz., butting collision between passenger trains, both running at full speed; first No. 7 going west and No. 8 going east. Both engines and several cars were wrecked and nine cars took fire and were burnt up. Five passengers, both enginemans, one fireman and four tramps were killed and 20 or more passengers and two trainmen were injured.

o, 28th, Chicago & North Western, Cheboygan, Mich., the engine of passenger train No. 3 was badly damaged by the breaking of the parallel rod. The train ran half a mile before it could be stopped, the engineman having been driven away from the cab. The fireman was badly injured.

rc, 28th, 2:53 a.m., Southern Pacific, near Esmond, Ariz., butting collision between passenger trains, both running at full speed; first No. 7 going west and No. 8 going east. Both engines and several cars were wrecked and nine cars took fire and were burnt up. Five passengers, both enginemans, one fireman and four tramps were killed and 20 or more passengers and two trainmen were injured.

rc, 28th, 2:53 a.m., Southern Pacific, near Esmond, Ariz., butting collision between passenger trains, both running at full speed; first No. 7 going west and No. 8 going east. Both engines and several cars were wrecked and nine cars took fire and were burnt up. Five passengers, both enginemans, one fireman and four tramps were killed and 20 or more passengers and two trainmen were injured.

rc, 28th, 2:53 a.m., Southern Pacific, near Esmond, Ariz., butting collision between passenger trains, both running at full speed; first No. 7 going west and No. 8 going east. Both engines and several cars were wrecked and nine cars took fire and were burnt up. Five passengers, both enginemans, one fireman and four tramps were killed and 20 or more passengers and two trainmen were injured.

rc, 28th, 2:53 a.m., Southern Pacific, near Esmond, Ariz., butting collision between passenger trains, both running at full speed; first No. 7 going west and No. 8 going east. Both engines and several cars were wrecked and nine cars took fire and were burnt up. Five passengers, both enginemans, one fireman and four tramps were killed and 20 or more passengers and two trainmen were injured.

rc, 28th, 2:53 a.m., Southern Pacific, near Esmond, Ariz., butting collision between passenger trains, both running at full speed; first No. 7 going west and No. 8 going east. Both engines and several cars were wrecked and nine cars took fire and were burnt up. Five passengers, both enginemans, one fireman and four tramps were killed and 20 or more passengers and two trainmen were injured.

rc, 28th, 2:53 a.m., Southern Pacific, near Esmond, Ariz., butting collision between passenger trains, both running at full speed; first No. 7 going west and No. 8 going east. Both engines and several cars were wrecked and nine cars took fire and were burnt up. Five passengers, both enginemans, one fireman and four tramps were killed and 20 or more passengers and two trainmen were injured.

rc, 28th, 2:53 a.m., Southern Pacific, near Esmond, Ariz., butting collision between passenger trains, both running at full speed; first No. 7 going west and No. 8 going east. Both engines and several cars were wrecked and nine cars took fire and were burnt up. Five passengers, both enginemans, one fireman and four tramps were killed and 20 or more passengers and two trainmen were injured.

rc, 28th, 2:53 a.m., Southern Pacific, near Esmond, Ariz., butting collision between passenger trains, both running at full speed; first No. 7 going west and No. 8 going east. Both engines and several cars were wrecked and nine cars took fire and were burnt up. Five passengers, both enginemans, one fireman and four tramps were killed and 20 or more passengers and two trainmen were injured.

rc, 28th, 2:53 a.m., Southern Pacific, near Esmond, Ariz., butting collision between passenger trains, both running at full speed; first No. 7 going west and No. 8 going east. Both engines and several cars were wrecked and nine cars took fire and were burnt up. Five passengers, both enginemans, one fireman and four tramps were killed and 20 or more passengers and two trainmen were injured.

rc, 28th, 2:53 a.m., Southern Pacific, near Esmond, Ariz., butting collision between passenger trains, both running at full speed; first No. 7 going west and No. 8 going east. Both engines and several cars were wrecked and nine cars took fire and were burnt up. Five passengers, both enginemans, one fireman and four tramps were killed and 20 or more passengers and two trainmen were injured.

rc, 28th, 2:53 a.m., Southern Pacific, near Esmond, Ariz., butting collision between passenger trains, both running at full speed; first No. 7 going west and No. 8 going east. Both engines and several cars were wrecked and nine cars took fire and were burnt up. Five passengers, both enginemans, one fireman and four tramps were killed and 20 or more passengers and two trainmen were injured.

rc, 28th, 2:53 a.m., Southern Pacific, near Esmond, Ariz., butting collision between passenger trains, both running at full speed; first No. 7 going west and No. 8 going east. Both engines and several cars were wrecked and nine cars took fire and were burnt up. Five passengers, both enginemans, one fireman and four tramps were killed and 20 or more passengers and two trainmen were injured.

rc, 28th, 2:53 a.m., Southern Pacific, near Esmond, Ariz., butting collision between passenger trains, both running at full speed; first No. 7 going west and No. 8 going east. Both engines and several cars were wrecked and nine cars took fire and were burnt up. Five passengers, both enginemans, one fireman and four tramps were killed and 20 or more passengers and two trainmen were injured.

rc, 28th, 2:53 a.m., Southern Pacific, near Esmond, Ariz., butting collision between passenger trains, both running at full speed; first No. 7 going west and No. 8 going east. Both engines and several cars were wrecked and nine cars took fire and were burnt up. Five passengers, both enginemans, one fireman and four tramps were killed and 20 or more passengers and two trainmen were injured.

rc, 28th, 2:53 a.m., Southern Pacific, near Esmond, Ariz., butting collision between passenger trains, both running at full speed; first No. 7 going west and No. 8 going east. Both engines and several cars were wrecked and nine cars took fire and were burnt up. Five passengers, both enginemans, one fireman and four tramps were killed and 20 or more passengers and two trainmen were injured.

rc, 28th, 2:53 a.m., Southern Pacific, near Esmond, Ariz., butting collision between passenger trains, both running at full speed; first No. 7 going west and No. 8 going east. Both engines and several cars were wrecked and nine cars took fire and were burnt up. Five passengers, both enginemans, one fireman and four tramps were killed and 20 or more passengers and two trainmen were injured.

rc, 28th, 2:53 a.m., Southern Pacific, near Esmond, Ariz., butting collision between passenger trains, both running at full speed; first No. 7 going west and No. 8 going east. Both engines and several cars were wrecked and nine cars took fire and were burnt up. Five passengers, both enginemans, one fireman and four tramps were killed and 20 or more passengers and two trainmen were injured.

rc, 28th, 2:53 a.m., Southern Pacific, near Esmond, Ariz., butting collision between passenger trains, both running at full speed; first No. 7 going west and No. 8 going east. Both engines and several cars were wrecked and nine cars took fire and were burnt up. Five passengers, both enginemans, one fireman and four tramps were killed and 20 or more passengers and two trainmen were injured.

rc, 28th, 2:53 a.m., Southern Pacific, near Esmond, Ariz., butting collision between passenger trains, both running at full speed; first No. 7 going west and No. 8 going east. Both engines and several cars were wrecked and nine cars took fire and were burnt up. Five passengers, both enginemans, one fireman and four tramps were killed and 20 or more passengers and two trainmen were injured.

rc, 28th, 2:53 a.m., Southern Pacific, near Esmond, Ariz., butting collision between passenger trains, both running at full speed; first No. 7 going west and No. 8 going east. Both engines and several cars were wrecked and nine cars took fire and were burnt up. Five passengers, both enginemans, one fireman and four tramps were killed and 20 or more passengers and two trainmen were injured.

rc, 28th, 2:53 a.m., Southern Pacific, near Esmond, Ariz., butting collision between passenger trains, both running at full speed; first No. 7 going west and No. 8 going east. Both engines and several cars were wrecked and nine cars took fire and were burnt up. Five passengers, both enginemans, one fireman and four tramps were killed and 20 or more passengers and two trainmen were injured.

rc, 28th, 2:53 a.m., Southern Pacific, near Esmond, Ariz., butting collision between passenger trains, both running at full speed; first No. 7 going west and No. 8 going east. Both engines and several cars were wrecked and nine cars took fire and were burnt up. Five passengers, both enginemans, one fireman and four tramps were killed and 20 or more passengers and two trainmen were injured.

rc, 28th, 2:53 a.m., Southern Pacific, near Esmond, Ariz., butting collision between passenger trains, both running at full speed; first No. 7 going west and No. 8 going east. Both engines and several cars were wrecked and nine cars took fire and were burnt up. Five passengers, both enginemans, one fireman and four tramps were killed and 20 or more passengers and two trainmen were injured.

rc, 28th, 2:53 a.m., Southern Pacific, near Esmond, Ariz., butting collision between passenger trains, both running at full speed; first No. 7 going west and No. 8 going east. Both engines and several cars were wrecked and nine cars took fire and were burnt up. Five passengers, both enginemans, one fireman and four tramps were killed and 20 or more passengers and two trainmen were injured.

rc, 28th, 2:53 a.m., Southern Pacific, near Esmond, Ariz., butting collision between passenger trains, both running at full speed; first No. 7 going west and No. 8 going east. Both engines and several cars were wrecked and nine cars took fire and were burnt up. Five passengers, both enginemans, one fireman and four tramps were killed and 20 or more passengers and two trainmen were injured.

rc, 28th, 2:53 a.m., Southern Pacific, near Esmond, Ariz., butting collision between passenger trains, both running at full speed; first No. 7 going west and No. 8 going east. Both engines and several cars were wrecked and nine cars took fire and were burnt up. Five passengers, both enginemans, one fireman and

growing and imperative demands for increased facilities, arising from the natural growth of our city, it is evident that new lines should now be laid down and put under construction as soon as possible, and that steps should be taken to improve the existing facilities so as to permit them to carry the increased burden during the time when the new lines are being constructed. The scope and extent of the present subway system were unfortunately limited by a decision of the courts and the financial position of the city, so that the Board was compelled to lay out one line to serve both the east and west sides of the city. This attempt necessarily involved a certain sacrifice in directness, which directness is essential for quick time. This defect should now be removed by extending the subway south from Forty-second street along Broadway, and north from Forty-second street at Park avenue.

"As presenting the quickest means of securing immediate relief, I suggest the following alterations in the Manhattan (elevated) structure and method of operation:

"Second Avenue Division—Add two tracks from the Harlem river to Chatham Square, carrying the two new tracks over the Chatham Square junction and over the Park Row line to City Hall.

"Third Avenue Division—Extend the third track from Fifty-ninth street to Ninth street, so as to make it continuous from the Harlem river to the latter point.

"Suburban Division—Add a third track from south of the Harlem river to Westchester avenue.

"Sixth Avenue Division—In order to furnish special trains for the retail shopping district lying north of Fourteenth street, and in order to furnish a connection to the terminus of the New York and Jersey tunnel at Greenwich and Christopher streets, I would propose an extension of the Sixth avenue division along Christopher street to Greenwich street, connecting with the Sixth avenue division at the north end of the Eighth street station, and thence lay a third track on the Sixth avenue structure northward. By this means many northbound trains could run 'local' through the wholesale dry goods district, as a gathering ground, and having become filled by the time they reach Eighth street, could then pass on to the third track and run 'express' to Harlem. The relief thus provided to the local track north of Eighth street would permit trains to start from Christopher street and run 'local' through the retail district.

"Ninth Avenue Division—I recommend:

"(1) The extension of the third track from Fourteenth street south to Cortlandt street, so that the express service may begin from the latter point.

"(2) A branch from the main structure at Fifty-third street, running westerly along Fifty-third street to Tenth avenue, northerly along Tenth avenue to Fifty-fifth street, where, owing to the topography, the elevated structure can be depressed into the subway and so carried under Amsterdam avenue to a connection with the subway at Seventy-second street. This connection can be built rapidly, and would serve in connection with the third track extension to Cortlandt street, as an immediate means of carrying the traffic assembling in the upper limits of the subway direct to South Ferry, thus giving some measure of relief pending the completion of the subway to the same point.

"(3) The extension of the third track from One Hundred and Sixteenth street north to One Hundred and Fifty-fifth street, making a continuous third track from Cortlandt street to the Harlem river.

"(4) Make an arrangement with the Putnam Division of the New York Central Railroad by which the present bridge across the Harlem river can be reconstructed into a three-track structure, and then extend the Eighth avenue line across the Harlem river, with three tracks, and by Jerome avenue, northerly to Woodlawn, and thence westerly in the neighborhood of Mosholu avenue to a connection with the Putnam Division in Van Cortlandt Park. This line will furnish in the quickest and most direct manner good service for what constitutes the largest inhabitable area of the old city of New York, which is to-day without rapid transit facilities.

"In regard to the Borough of Queens, the city is now

constructing a bridge from the foot of Sixty-fourth street across Blackwell's Island, which will be completed in the course of two or three years. When this is done I suggest that a branch of the Second Avenue Elevated be constructed along Sixty-fourth street and over the bridge, to Long Island, and a plaza be then arranged, permitting the present surface lines now plying throughout that dis-

As soon, therefore, as the Board has examined the plans covered by this report, another plan, equally comprehensive it is hoped, will be laid before you covering the Borough of Brooklyn."

A Few European Locomotives.

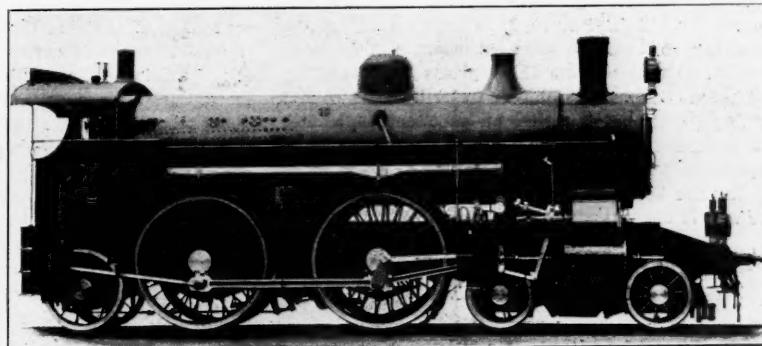


Fig. 1.—Express Locomotive—Austrian State Railroads.

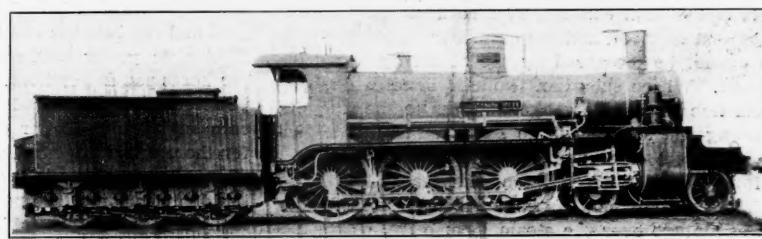


Fig. 2.—10-Wheeler—Italian Mediterranean Railroad.

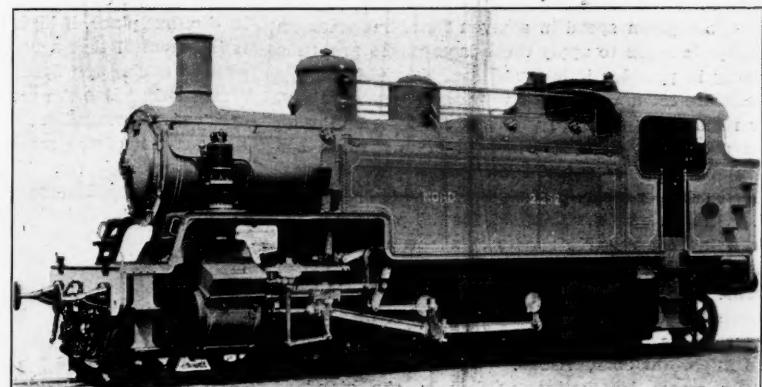


Fig. 3.—Suburban Tank Locomotive—Northern of France.

trict to approach and deliver their passengers to the elevated. At present the development of Long Island City and Queens is not sufficiently concentrated to warrant the expensive construction of special rapid transit lines.

"In Brooklyn, a similar plan should be carried out, of adding new lines where such new lines are needed to reach territories not now served; to expand existing lines where the present service is inadequate; and, above all, to better utilize present means of communication between Brooklyn and Manhattan, to provide new and better means, and also to furnish to residents in Brooklyn facilities for distribution in Manhattan, and to avoid the terrible congestion now existing at a single point.

An express locomotive of the Austrian State Railroads is shown by Fig. 1. The cylinders are compounded on the Gölsdorf system and are 13.8 in. and 23.6 in. in diameter with a stroke of 26.8 in.

Interesting features of the engine are the wheel arrangement and the large drivers. The drivers are 84½ in. in diameter. The weight on drivers is only 63,900 lbs., with 2,500 sq. ft. of heating surface.

Another foreign locomotive is shown by Fig. 2, and is a 10-wheeler of the Italian Mediterranean Railroad. The cylinders are connected to the leading pair of drivers. This arrangement is used on some 10-wheelers lately built for the Caledonian Railway of Scotland, and shown in our issue of October 10.

The Northern of France has recently built a number of tank locomotives for use in heavy and fast suburban service. One of these is illustrated by Fig. 3. The tank is placed on the sides and directly over the drivers. The rear and forward ends of the engine are each carried on four-wheel trucks.

The fire-box is above the rear drivers and rests on the frame plates with the interposition of rollers. The boiler barrel is joined to the locomotive frame close to the fire-box front by a plate ¾ in. thick. The boiler is also laterally stayed by brackets. The water tanks are jointed in front, and can be shifted upwards for inspecting the fire-box.

The weight on drivers is 71,680 lbs., and the maximum drawbar pull 17,920 lbs. The bogie trucks have no lateral play. The tank holds 1,848 gallons, and the coal capacity is 3.9 tons.

A great advantage in this new type is that the engine need not be turned around at the end of each trip. The locomotives and tenders formerly used had to be sent, on reaching the Northern Railway station at Paris, to one of the depots about two miles distant. This type of locomotive is similar in many respects to the Forney type much used in like service in this country.

Oak Ties.

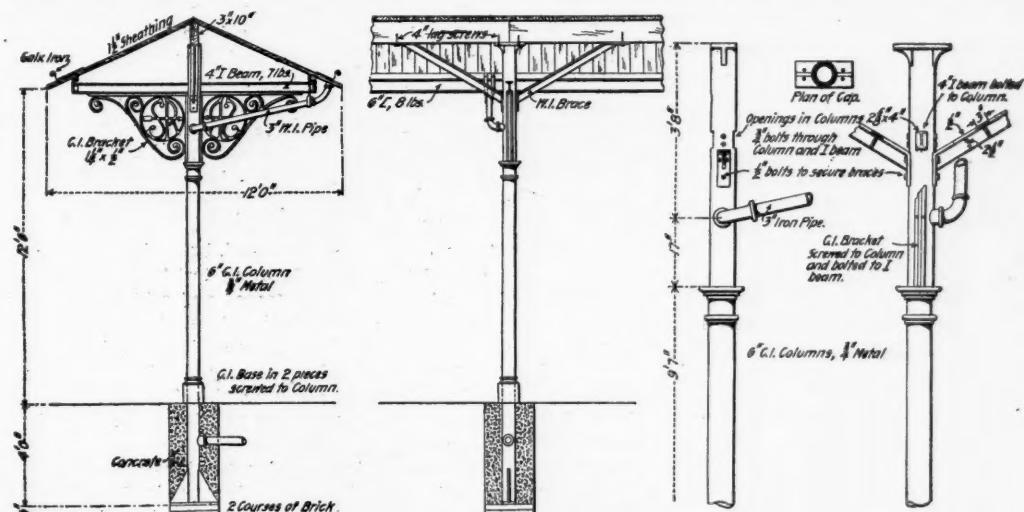
The Pittsburgh Dispatch estimates that the combined orders by Pittsburgh railroads for this year will run over 2,000,000 ties. The cost of these, estimated at 75 cents each, including transportation, is \$1,500,000. The freight amounts to 17 cents per tie from West Virginia, or an aggregate of \$340,000. The specifications for first-class ties have been kept up to the standard and on account of this and the diminishing supply of white oak, burr oak, chestnut oak and other varieties in West Virginia the railroads have had to seek ties south of the Mason and Dixon line.

Following the track of the Little Kanawha large tracts of timber lands have been purchased for speculation, and as soon as the extensions are opened the temporary scarcity will be relieved. Railroad officials say, however, that it is only a matter of time when the whole supply will be exhausted.

Umbrella Shed for Train Platforms.

We illustrate herewith a form of umbrella shed, designed some time ago by Mr. F. P. Milburn, of Columbia, S. C., for the Southern Railway.

The supports are 6 in. iron columns imbedded in a



Umbrella Shed for the Southern Railway.

Such a plan is obviously large, and so large, it seems to me, that it warrants consideration by your Board on its own merits, and free from possible complications if it is taken up in connection with the plans for Manhattan and The Bronx. This plan will necessarily deal with the problem of connecting in Manhattan the various bridges and tunnels going from Brooklyn to Manhattan.

concrete foundation. These supports are hollow, and are used as leaders to carry the water from the gutters to the drain pipes below. The roof is made of 1½ in. sheathing and is supported at the peak on 3 x 10 in. wooden beams. The transverse supports of the roof are made of 4 in. I-beams bolted to the cast-iron column. Wrought-iron T-bars brace the roof longitudinally.



ESTABLISHED IN APRIL, 1856.
PUBLISHED EVERY FRIDAY
At 32 Park Place, New York.

EDITORIAL ANNOUNCEMENTS.

CONTRIBUTIONS.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussion of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

ADVERTISEMENTS.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN OPINIONS, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

Connecticut has a general railroad law passed in 1871 and with provisions for sane financing, one of its sentences, for example, reading: "The amount of funded and floating debt shall at no time exceed the amount of cash actually paid in upon capital stock." How far the law applies to trolley enterprises of the State—most of them overcapitalized—is somewhat obscure, but the fact stands that during the last ten years, practically all trolley projects have been financed under special charters. In new railroad building, the general law appears to have been essentially a dead letter. But there has just been introduced in the legislature a bill which in effect would repeal the general act; not because it has been dead wood, but because it promises at last to be of some force. The steam companies and the operating trolley corporations, both dreading electric parallels, have combined to compel all railroad projects hereafter to take out special charters—of course to be defeated if they menace existing vested interests and to be let through if they don't. The upper and lower houses of the legislature have already locked horns in the matter over a question of committee reference, and the hottest fight of the session is promised—possibly involving a renewal of the old "Montague farm" contest. That interests which have for years evaded a sound general law and profited by the evasion so as to issue bonds in excess of their stock, should now demand its abrogation on the ground that it may come to life, certainly introduces us to a sardonic phase of railroad legislation.

In present times, when every day's work of every locomotive is needed the trouble experienced from bad water becomes relatively more serious. The actual losses per year per engine, resulting from the incrustation of the boiler interior from hard water are great, and the estimates have ranged from \$750, the figures given in the Master Mechanics' committee report of 1870, to \$460 and to \$710; the last being the figures given in these columns June 22, 1900, page 425. In the latter case it was further estimated that with the incidental advantages to accrue from the use of good water and to which a money value should be assigned, the total annual saving would approach \$1,000. But account was not then taken of the greater time during each year that the engine would be in service and of its increased earning capacity. One estimate recently made of the amount of an engine's time spent in the shop and in being washed out placed this at 15 per cent.; seven or eight weeks a year. Or, stated another way, the average monthly mileage for engines in all classes of service is in excess of 3,000 miles, and the loss due to bad water is 450 miles a month. Locomotives are expected to make from 150,000 to 200,000 miles between general repairs periods, but the flue mileage in bad water districts, and particularly on wide firebox engines is under 75,000 miles. The lessons from

these facts are so apparent that they need not be stated here. On another page the Chicago & North Western's apparatus for the purification of feed water before delivering it to the locomotive tank is described. The company has adopted it as standard and the simplicity of the apparatus commends it to consideration. Although it has been in use but a short time, according to the reports from the road the results obtained have been excellent. The undertaking to turn to practical account the waste product, or sludge, from these plants is interesting, and should be successful. The North Western has already found that it makes an excellent whitewash and has made considerable use of it for that purpose. Experiments looking to profitable use of it for boiler lagging are hopeful; for it has heat-insulating qualities and is cheap.

Suburban Locomotives.

The competition of electric railroads inspires a juster appreciation of the benefits to be derived from a large suburban traffic. In most cases but a small part of the total earnings of a road comes from the suburban services, and the cost of the suburban traffic cannot be measured by the actual operating expenses. Where suburban traffic is handled on busy main line tracks the congestion due to the frequent starting and stopping is no small factor in the general problem of economical railroad operation.

It is the quick acceleration and retardation in the starting and stopping of trains which gives electricity an advantage over the steam locomotive, where frequent stops are made and the distances covered are short. All text books on mechanics give formulae for calculating the force required to accelerate a given mass to a given speed in a given time, but when an attempt is made to apply these laws to the problems arising in practice it is found that many of the elements are indeterminate or varying in character and the results obtained are useless. All information on this subject at present which is of any value has been the result of experiment.

Last summer a series of tests was made by Messrs. W. B. Potter and B. J. Arnold, for the purpose of determining the relative merits of a steam locomotive and electric motor cars for the rapid acceleration of trains. We believe that a better showing could have been made for steam; but the results of these tests nevertheless form the basis for a number of useful and important comparisons.

The steam locomotive used was the standard double-end suburban type of the New York Central, having 128,000 lbs. on the drivers, 20 in. x 24 in. cylinders, 2,465 sq. ft. of heating surface and 63 sq. ft. of grate area. Two electric motor cars, each weighing 60,000 lbs., were used in the electric tests. The results obtained, therefore, are directly comparable inasmuch as the total weight on drivers was in each case about the same. The trains were started from rest and accelerated as rapidly as possible, the power being shut off at the three-quarter mile post and the brakes applied so as to bring the train to rest at the mile post. The steam trains ran on an average 500 ft. over the mile before stopping, and the electric trains about 150 ft.

The acceleration curves of the steam locomotive and the electric motor cars have different shapes. Thus, with six trailers (including a dynamometer car), the speed of the motor cars after 10, 20 and 30 seconds from starting was 11.2, 21.2 and 28.1 miles an hour, respectively, while the corresponding speeds for the steam locomotive were 9.7, 16.3 and 20.8 miles an hour. Although the steam locomotive was able to exert at starting a tractive effort equal to or even greater than the electric motors, this high tractive effort could not be maintained, but fell off rapidly as the speed increased. In every test the electric cars show a lower maximum speed and a higher average speed than the steam locomotives. Inasmuch as the energy consumed in making a given run in a given time is proportional to the square of the maximum speed attained, the electric motor should be expected to operate with a smaller expenditure of energy than the steam locomotive.

Furthermore, in an ideal system the total weight of the train should increase or decrease in direct proportion to the paying load. This is approximately possible with electric traction. Mr. Potter gives some interesting figures showing the energy consumed per passenger for both systems. With a train of six cars, carrying 384 passengers, the watt hours per passenger with steam are 43.9 and with electricity 29.7; but with a single car carrying 64 passengers the watt hours for steam becomes 187.8 and for electricity 45.2. In other words, the energy consumed per passenger

by the electric train tends towards a constant for varying loads. Roughly speaking, with a steam locomotive the heavier the train in proportion to the weight of the engine and tender, the greater will be the efficiency, while for an electric train the number of motor cars can be increased or decreased as the demands of the service require with like economic results. The steam locomotive is further handicapped by reason of the fact that a considerable portion of the total weight is carried on the truck wheels and is not available for tractive adhesion. With electric motor cars a large percentage of the paying load can always be utilized for tractive adhesion.

So far, the electric motor cars seem to have gained a complete victory over the steam locomotive; but, after all, economy of operation in such service and cost of fuel is not the all-important element. Mr. Potter has made a number of tests for the purpose of determining the relative cost of the two systems. He shows that the steam locomotive burns about 15.6 lbs. of coal per effective horse-power per hour, and that the total horse-power hours hauling coaches for a period of 24 hours is but 861. These figures include not only the amount of coal burned for the movement of cars in service, but also for the movement in the yard and the banking of fires. The coal consumption in electric power stations is approximately 2½ lbs. per horse-power per hour. If the losses between the power station and the driving wheels of the motor cars be taken at 50 per cent., the coal consumption for the electric system rises to 5 lbs., and if the cost of maintenance, the interest on capital invested and the depreciation of the property be considered, there is little margin upon which to base any claims for greater economy of the one system over the other.

The tests also point out possible lines along which future designs of suburban locomotives may be made. In the first place, if high acceleration is to be sought it is essential that a *uniform* high tractive effort be exerted during the first period of acceleration. In a steam locomotive the mean effective pressure in the cylinders is transmitted to the driving wheels through the medium of the connecting rod, and the rotative effort is not uniform. Also it should be borne in mind that the steam locomotive when working at a long cut-off is an inefficient machine and requires approximately 80 to 100 lbs. of water per horse-power per hour. If we take the case of the steam locomotive hauling six trailer cars, we find that the draw-bar pull, up to a speed of 8 miles an hour, is approximately 14,000 lbs. If the average speed during that period be taken at 5 miles an hour, the horse-power developed is about 340, which at 90 lbs. per horse-power per hour gives $340 \times 90 = 30,600$ lbs. per hour, as the rate at which the boiler must work. These figures are not rigorously correct, but we are safe in stating that a large heating surface is essential. With the engine in question, having about 2,500 sq. ft. of heating surface, the steam pressure could not be maintained at 200 lbs. during the tests.

Those who do not believe that a large boiler is necessary for suburban service should remember that the efficiency of a square foot of heating surface in a locomotive making frequent starts and stops is not the same as that for a locomotive operating continuously at high speed. Frequent starting and stopping is trying work on the boiler, because the draught and the condition of the fire are constantly changing.

The foregoing leads to the question: What is the most desirable design for suburban traffic? We do not pretend to lay down a rule for all classes of service, but in the light of the above experiments we may suggest:—First, The boiler should be as large as possible, and the fire-box should be wide. The greater the proportion of total heating surface in the fire-box, the better. Second, The ratio between the total weight, including fuel and water, and the weight on drivers should be as great as possible. Third, The rotative effort at the cranks should be nearly uniform. In other words, three cylinders, with cranks at 120 degrees, or even four cylinders, are desirable. Fourth, Special care should be taken in the design of the draft arrangement. A variably exhaust tip, controlled, perhaps, by the position of the reverse lever, would be of advantage. The steam passages and especially the exhaust ports should be large and direct, and the valve motion should give equally good distribution, whether in forward or backward gear. We have only enumerated some of the more important points to be considered in the design of a suburban locomotive. In this connection we wish to call the attention of the reader to a detailed description which appears in another column of Mr. Holden's new 10-coupled suburban tank locomotive for the Great Eastern of England, the total weight of which rests upon the drivers. It will be seen that this design has been worked out pretty much along the lines sug-

gested above, and we shall watch its performance with interest.

It should never be lost sight of, however, that the electric motor, with its uniform and well maintained torque, is the ideal locomotive for suburban work, and it only remains for those skilled in the art to develop some system whereby the current can be delivered from the power-house to the motor and be made available for pulling trains with a minimum expenditure of capital and energy. Meanwhile there is a place for a well designed suburban steam locomotive.

THE U. S. STEEL PREFERRED-STOCK RETIREMENT.

The Court of Errors and Appeals, the Court of last resort, in New Jersey, has just handed down its opinion in the case of Hodge against the United States Steel Corporation which sets at rest the question of the legality of the proposed retirement of preferred stock of that company.

The large amount involved in the scheme made the movement a notable one in the world of finance, aside from the general interest of the public in this, the greatest of modern corporations. The main feature of the plan proposed by the directors was to retire \$200,000,000 of the preferred stock by purchasing it at par with five per cent. bonds, and to issue \$50,000,000 more of such bonds to be sold for cash, for the general purposes of the company. The Finance and Executive Committees had unanimously approved the plan, and it thus came to the stockholders with the endorsement of the entire management of the company. It was pointed out in the Schwab circular letter to the stockholders that of the total capital of one billion dollars, \$500,000,000 was represented by preferred stock, which carried the right to an annual cumulative dividend of seven per cent. before any dividend could be declared on the common stock, which also amounted to \$500,000,000. By substituting \$200,000,000 of bonds for an equal amount of the preferred stock, the company would save annually two per cent. on the stock retired—that is, the comfortable sum of four million dollars, or, after providing for interest on the extra \$50,000,000 of bonds, an annual net saving of \$1,500,000.

The scheme was bitterly assailed, as illegal and as immoral. But the powerful interests behind it made combination against it weak and irresolute. It was claimed that the ten millions which the syndicate, mainly composed of directors of the company, were to get for guaranteeing the success of the scheme in part, was an exorbitant charge for the service to be rendered, and that its payment was forbidden by law as well as common honesty. Both sides rushed into print and the outside public, having nothing apparently to gain or lose by the controversy, but greatly interested in the mere bigness of the amounts involved, were entertained by the dialectical skill with which the irrefutable charge was completely refuted. But the opposition did not confine themselves to moral suasion alone. They sought also that consolation which the right minded are always supposed to find in courts of equity.

THE BERGER CASE.

First, one Mistress William Berger made play for pin money. She sued as a preferred stockholder before Vice-Chancellor Emory of New Jersey to enjoin the consummation of the scheme upon the ground that the issue of her stock constituted a contract between herself and the corporation which couldn't be changed without her consent, that as her stock bore the perpetual right to a seven per cent. cumulative dividend, the substitution of a five per cent. bond materially altered her rights—a thing not lawful for the company to do.

The progress of the Berger suit was watched with much greater interest than the real nature of the question before the Court justified. From the newspaper trial of the case, we had all supposed that the question to be decided affected the rights of preferred stockholders in corporations, wherever organized. A principle was about to be laid down, we thought, novel in character and far reaching in its effect in defining the status of stock in all kinds of corporations. The decision of the Vice-Chancellor to a certain extent justified the popular impression. Assuming the real nature of the controversy to be as stated by him, there was a general feeling of relief that the aggregation even of the millions and billions in this vast corporation was not strong enough to cope with the old-fashioned principle that no State shall pass any law invalidating contracts; that courts shall construe, not make, contracts; that directors, however powerful, shall not confiscate vested rights. For the Vice-Chancellor found, as matter

of fact, that the proposed scheme did materially change the rights of the holder of preferred stock, and as matter of law, that neither the management nor the other stockholders could legally do this. And thus once more the integrity of jurisprudence peculiar to this country, was vindicated, and we all breathed a sigh of relief.

But when the case was thrashed out in the Court of Errors and Appeals and that tribunal had handed down its reversing decision, the delusion that it involved a question of national or international importance fell like scales from the eyes of the blind.

It turned out, after all, to be simply a question of construction of a statute, peculiar to New Jersey, which was passed in the year 1896. This statute gave the right to corporations, organized under it, to retire any kind of its stock upon a vote of two-thirds in interest of each class of stockholders; among other ways, by the purchase at not above par of the shares to be retired. The law further provided that the statute and all amendments of it, should be a part of the charter of every corporation formed under it, except, of course, so far as inappropriate to the objects of such corporation. The Court thus finally held that there existed an inherent right in a two-thirds majority in interest of the stockholders of the U. S. Steel Corporation, from the moment of its inception in 1901, to retire all or any portion of its preferred stock *by purchase* as well as by other methods not germane to the case under consideration. Mrs. Berger then contended that the proposed scheme did not contemplate a purchase in the sense of that word as used in the statute. But the Court held that the language was broad enough to cover a purchase by bonds as well as by cash, the proceeds of bonds. If Mrs. Berger did not want bonds, she could call for par, in cash, but she could not insist that other stockholders should be paid in cash, when they preferred bonds instead of cash.

Thus the fundamental fact, upon which this litigant lady proceeded, did not exist, as she supposed. In doing what they did, her fellow stockholders were authorized by the charter of the very corporation in whose stock she had invested. Of what, therefore, could she complain except of her own imprudence in buying that kind of stock? But that is another story to which the Courts listen with scant sympathy.

The Berger case will furnish little precedent outside the State of New Jersey or except in connection with the special statute and its amendments that the Court construed. No invasion of general corporation law has been made by the decision. The policy of the State in authorizing corporations with such powers need not be discussed in the effort to find out the effect of this case.

THE HODGE CASE.

And now comes along the decision in the companion suit of Hodge. Its effect is even narrower and of less general interest than that in the Berger case. Mr. Hodge also sought, and with success in the first instance, the aid of the New Jersey Court of Equity, in enjoining the scheme adopted by the stockholders. But he proceeded on grounds essentially different from those taken by Mrs. Berger. She assailed the constitutionality of the scheme as applied to her; he the methods of its carrying out. She disputed the power to do the act; he the regularity of the way in which it was done.

The validity of the proposal to retire the preferred stock having been upheld in Mrs. Berger's case, Mr. Hodge did not seek to re-open that question but he claimed that the contract with the syndicate to pay them four per cent. commission on the face of all bonds that they should either take in cash or exchange for stock, was fraudulent and void, for the reason that fifteen, or more, of the twenty-four members of the board of directors were interested in the syndicate, and that if the votes of the stockholders interested in the syndicate were not counted there were not enough voting to approve the plan, under the statute.

The Court recognizes the well settled principle that directors of corporations, like other trustees, are forbidden to make contracts with themselves in the matter of their trust, and that such agreements are voidable at the instance of those having a right to object. And if it appeared that such objectors were fully informed of the facts, they had as much right to approve, as they had to reject, the voidable arrangement. The Court finds upon the evidence that there was absolutely no ground for the charge that the facts were withheld from the stockholders, but that on the contrary the widest opportunity was given for the fullest inquiry before the resolution was adopted by the stockholders.

Being possessed of all the facts, and having approved the plan, the majority stockholders were acting within their rights, and the minority could not complain.

The Court refused to tolerate the principle that a stockholder who has an interest outside of and different from the other stockholders can be debarred from voting for a lawful proposition. It was accordingly held that the members of the syndicate had the right to vote as stockholders for the scheme, though it did mean so much more to them than to the other stockholders.

In both these cases the Court refused to go into the question of the wisdom of the scheme adopted. It adhered to the well known doctrine of the law of corporations that a court of equity will not substitute its judgment for the judgment of the board of directors or the stockholders acting within their respective spheres. A plan, duly authorized, is part of the business of the corporation, and in the absence of bad faith the Court will not interfere because some other course would be less expensive or generally wiser.

Both these cases give additional illustration to the lesson that is beginning to be taught quite plainly now, that where a great majority in interest of the stockholders of a corporation agree upon a plan of procedure within the limits of the law the Courts will not interfere with the consummation because the interests of the minority are thereby prejudiced or even sacrificed. The plan may be a very unwise one. It may be a very injudicious thing to do. It may be prejudicial to the real interests even of those who advocate it, or it may be very costly to the corporation. Some other plan may be better or less expensive. None of these afford ground for the intervention of the Court. If the scheme is within the power of the corporation or within the legal rights of the majority, its commercial results are of no consequence whatever in a court of justice. A court of equity will never intervene between a fool and his folly and it holds, wisely no doubt, that if one investing in corporate securities does not like the range of change which they may lawfully assume while in his possession, he must go for relief somewhere else than to a court of justice.

JANUARY ACCIDENTS.

We publish in another column a condensed record of the principal train accidents which occurred in the United States in the month of January. The record contains accounts of 46 collisions, 22 derailments, and 7 other accidents. Those which were most serious, or which are of special interest by reason of their causes or attending circumstances, occurred as follows:

3d, Weems, Ala.	20th, Philadelphia Road, O.
*7th, Cochran, Pa.	21st, Keenbrook, Cal.
*8th, Ada, Ohio.	*22d, South Freeport, Ill.
9th, Bethalto, Ill.	22d, South Greenfield, Mo.
11th, Harper's, Wyo.	*27th, Westfield, N. J.
16th, Cumberland, Md.	*28th, Esmond, Arizona.
16th, Gunnison, Colo.	*28th, La Fox, Ill.
20th, Chiawakum, Wash.	
(12 employees killed).	

It is not necessary to tell the reader that some unusually serious train accidents occurred in the month of January, though it may not have occurred to him that the list would include so many as are tabulated above. In the six accidents which were fatal to passengers, 37 passengers and 11 employees were killed and 90 passengers and 4 employees were injured. These accidents in the order of their importance are Westfield and Esmond (Vail); Ada, Cochran, La Fox and South Freeport. The collision at Westfield has been quite fully discussed in our issues of Feb. 6 and Feb. 20, and that at Ada was referred to in an editorial note of Jan. 30. The collision near Esmond (a non-telegraph station) was due to a cause which has figured in other cases recently. Forgetting or mislaying one or two or more orders in a telegraph office is a kind of mistake to be guarded against by severely strict rules for handling orders; such for example as one requiring orders to be laid (or hung up) in a particular spot before giving to the dispatcher the final assurance which leads him to give the duplicate order to the other train. But sending the conductor's name before he has written his signature looks to the distant critic like a purely moral fault; one which is to be corrected only by improving the conscientiousness of the operators. This is a comparatively easy task if one takes time enough and pay good salaries, but a hard one in the wilds of the desert at ordinary salaries. We cannot presume to criticize in this particular case, because we do not know the circumstances; but we cannot ignore the comment very commonly made in cases like this, that railroading in remote and sparsely settled countries is always difficult. Without denying this, it is in order to say that the greater the difficulty the greater the necessity for very slow schedules. In the present case both trains were several hours late and there was therefore every temptation to run as fast as possible; but the advocate of safety cannot admit the existence of any better reasons for taking risks with a delayed train than with one which is on time. The pecu-

liar merit of the absolute block system is that it necessarily treats delayed or extra trains exactly like regular trains.

The other three disasters to passengers were serious enough, and at another time would excite much comment, but just now they are overshadowed by the worse accidents occurring almost at the same time.

Taking the remaining cases in the above list, in their order, the first one of peculiar interest is that which occurred on the 16th at Cumberland, Md., where four persons were killed in consequence of the violation of the rule forbidding the presence of unauthorized persons in a signal cabin. We do not recollect ever hearing of a serious accident from such a cause as this, either in this country or England, though the collision at West Dunellen, N. J., in January, 1899, killing 16 passengers, was due chiefly to the unauthorized clearing of a signal by a telegraph operator who was rightfully in the cabin but was not on duty as operator. Either kind of error is so rare that moralizing on the specific negligence is futile; the only preventive measure that appears to be worth trying to apply is the general one of reining up every signalman to the strictest standards in all his acts. The man who is safest from this mistake is the one who gives the most conscientious, cool and intelligent attention to each little detail of his work throughout every day. This is a very trite homily; but it is justified by the youth and the scant experience of hundreds of signalmen who ought to heed it.

The tragedy at Chiawaukum is notable chiefly by its magnitude. One of the accidents included in the list printed above, that at Philadelphia Road, Ohio, was a boiler explosion which wrecked parts of two trains; and there were no less than six other boiler explosions, namely: 2d, Shelburne, Vt.; 3d, Bedford, Va.; 12th, Memphis, Tenn.; 17th, Castleton, N. Y.; 18th, Monrovia, Md.; 20th, Berlin Falls, N. H.

There was a serious butting collision on the Grand Trunk near Merriton, Ontario, Jan. 3, between eastbound passenger train No. 4 and a westbound locomotive. One fireman was killed and the other fireman and both enginemen were injured. One week later, on the same road, there was a collision of freight trains at Port Robinson, in which one fireman was killed and both enginemen were injured.

The electric car accidents in the United States in January numbered 14; number of persons killed two, and of injured 61.

The descriptions of the new "reciprocating rotating spiral engine" which appear in the daily papers present a matter of absorbing interest to those who know nothing of such subjects. The engine differs from others in that the reciprocating motion of the piston is transformed into rotary motion through the medium of the cross head, which works in a shaft having right and left spiral grooves. In other words, there is no crank. The inventor is not satisfied, however, with such meager honors, but claims the following. "Take for example a crank type of engine of 100 h.p., running 100 per minute, using 100 lbs. of steam. In order to do this, steam must be taken 200 times. With our motor attached, the same 100 lbs. of steam will turn the driving point 100 but steam will be taken only 100 times. We can change any type of reciprocating engine and make it do the same work with one-half or one-third the steam." This is a moderate example of the lengths to which genius will go, for another recent story tells of two Bible students who have discovered a new "force" destined to revolutionize human affairs. They are at present dividing their time between the study of the good book and the building of a machine which will utilize this new power. The editor of the *Electrical Review* suggests that they concentrate their energy upon their Bible study. This is wise advice, and we recommend Proverbs 27:22. It seems to be a prevalent notion that the great discoveries of the world have been made by chance. It is true that Roentgen accidentally discovered the X ray, but he had previously spent years of patient study, investigating vacuum tube phenomena. It is also told, and we have no reason to doubt it, that Sir Isaac Newton was sitting in his garden when an apple fell, and that the incident suggested to him a line of study which ultimately resulted in his formulation of the three laws of motion. The fundamental discoveries of Newton, Galvani, Oersted, Faraday, Kelvin and others have in each case been the result of years of study and research, and were not evolved by the mysterious methods of the Pre-Baconian philosophers.

NEW PUBLICATIONS.

The Earnings Power of Railroads, with tables showing facts as to earnings, capitalization, mileage, etc., of 112 railroads in the United States and Canada. By Floyd W. Mundy, 71 Broadway, New York. 1903.

The first edition of this book, a year ago, was described in the *Railroad Gazette*, Feb. 21, 1902. This edition is in form the same, but Mr. Mundy's novel methods of analysis are applied to the annual reports of the year just passed. It is valuable.

TRADE CATALOGUES.

The Plunger Elevator Company, Worcester, Mass., has issued an artistic 15 page catalogue. It is said that the company has recently installed plunger elevators having over 200 ft. total travel and operating at speeds of 500 to 600 ft. per minute. A list of important installations is given.

Electric hoists is the title of a small 11 page pamphlet sent out by the C. W. Hunt Company, New York, which briefly describes and illustrates several standard and special designs of hoists.

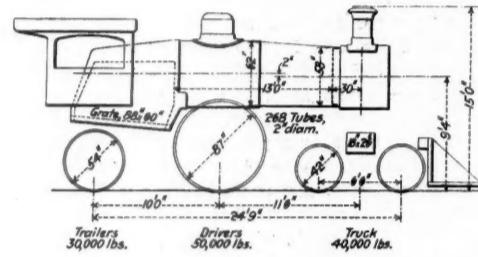
The Delaware, Lackawanna & Western has published a pamphlet entitled "Modernizing a Trunk Line," which is a reprint of the article on the Lackawanna improvements since 1899, from the Nov. 14 issue of the *Railroad Gazette*. The pamphlet is illustrated with 14 cuts showing special features of the work. It may be obtained by addressing T. W. Lee, General Passenger Agent, New York.

A Proposed Single Driver Locomotive.

BY PAUL T. WARNER.

In these days of various locomotive types, and the designing of engines to do special work, there seems to be a field in which a well designed single driver locomotive could render efficient service. The editorial in the *Railroad Gazette* of January 23 was quite to the point in this respect; and the success of the single locomotive in England, in handling trains of about 200 tons at very high speed, would lead us to expect that, with the liberal American loading gage, an efficient and economical single engine could be made more than a possibility.

The diagram presented herewith shows the principal features of a single driver locomotive with simple cylinders, designed for burning bituminous coal, and capable of hauling, on a level, a load of 250 tons, exclusive



Single Driver Locomotive.

of its own weight, at 60 miles an hour. The wheel spacing is similar to that of an eight-wheel engine, and the boiler, while pitched high, is not above the limit allowed by modern practice. In fact, the same boiler could be used with 92 in. wheels, but a diameter of 87 in. seems to be sufficient for the highest speeds. The weights are also within reasonable limits; 50,000 lbs. per axle being frequent in large coupled engines. The heating surface is as follows:

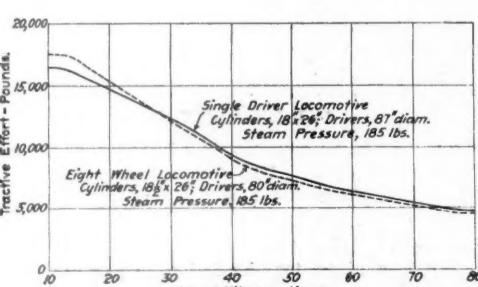
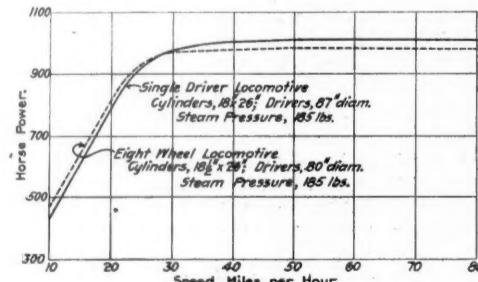
Tubes	1,824 sq. ft.
Fire-box, about	140 "
Total, about	1,964 sq. ft.
Grate area	36.6 "

The principal ratios are as follows:

Heating surface divided by grate area	53.6
Tube heating surface divided by fire-box heat'g surface	13.0
Heating surface divided by cylinder volume	256
Grate area divided by cylinder volume	4.79
Total weight divided by heating surface	61.1
Weight on drivers divided by heating surface	25.5
Weight on drivers divided by tractive effort	3.04

Comparing these ratios with those of recent coupled express engines, it is noticed that the total weight per sq. ft. of heating surface is rather high. The heating surface is very large, however, in proportion to the weight on the drivers, and the boiler power is ample for the cylinders, and in this respect follows closely the lines of recent practice for wide fire-box bituminous coal burning engines.

The accompanying curves show the relation between tractive effort and speed, and horse-power and speed, on a straight level track, for the new engine, in comparison with similar curves for a well-known eight-wheel engine employed in fast passenger service on an eastern



road. The locomotive referred to has 18 1/2 x 26 in. cylinders, 80 in. drivers, and 185 lbs. steam pressure. The tractive efforts at various piston speeds were determined by means of factors given in the Schenectady Locomotive Works catalogue; and the curves, while somewhat approximate, are very fair so far as comparison is concerned. It is noticed that, owing to the comparatively slow piston speed of the single engine, and the consequently higher mean effective pressure on the pistons, the curve of tractive power shows less drop than that for the coupled engine; and at speeds exceeding 28 miles an hour, the tractive power exceeds that of the eight-wheelers.

The single engine labors under the disadvantage of a low tractive factor (i.e., weight on drivers divided by tractive effort) at speeds of less than 30 miles an hour; and a traction increaser would be useful in the design under consideration. An arrangement similar to that used on the New York Central Atlantic type engines could be conveniently employed. This device was, in fact, used by the Baldwin Locomotive Works on the single driver built by them for the Philadelphia & Reading in 1880. By increasing the weight on the drivers to 60,000 lbs. at starting, the tractive factor becomes 3.65 at a slow pull. The successful experience of British railroads with single driver engines having a tractive factor as low as 2.60, leads to the conclusion that, with the assistance of this device, the engine under consideration would be able to utilize its cylinder power to advantage. Such a locomotive should, of course, be kept at strictly high speed work, as the liability to slip at moderate speeds, if the rail is not in good condition, is very great; the tractive factor at 30 miles an hour with the normal weight on the drivers being only 4.10. But on a low grade division, where speed is high, loads moderate and stops infrequent, the single engine should prove highly efficient.

The horse-power curve shows the maximum for the single to be about 1,010. These curves were constructed directly from the curves of tractive effort, and show the maximum indicated power that the engines can develop at any particular speed. For the single driver engine, allowing a consumption of 25 lbs. of water and 4 lbs. of coal per horse-power hour, the boiler performance at the maximum would be as follows:

Water evaporated per hour, lbs.	25,250
Water evaporated per sq. ft. of heating surface per hour, lbs.	12.9
Horse-power developed per sq. ft. of heating surface	.51
Coal burned per hour, lbs.	4,040
Coal burned per sq. ft. of grate per hour, lbs.	110
Horse-power developed per sq. ft. of grate surface.	27.6

These figures are within the limits of boiler performance.

The scheme for a single driver engine, as here outlined, could, of course, be greatly elaborated. For burning inferior fuel, the Wootten fire-box can be easily employed, as is done on the Reading singles; and the engine could also be compounded to great advantage. Why should not the balanced arrangement, as used on the Baldwin ten-wheel engine No. 20,000, be successfully applied to a single driver locomotive? Cylinders 13 and 22 in. in diameter by 26 in. stroke would be about right for the adhesive weight, and the balance would be almost perfect, as not even coupling rods would be present to necessitate counterweights. Such an engine, fitted with a well designed valve gear, a traction increaser, and a sand-box of liberal proportions, should not give much trouble from slipping; and, it seems to the writer, would prove an almost ideal machine for light, high speed service.

The Railroad to Astrachan.

The Volga is now perhaps the most important river transportation route in the world, having something of the importance which the Mississippi and its tributaries had in the early days of railroads. But the Volga has two great deficiencies: its mouth is in a land-locked sea surrounded for the most part by a barren country, which till the development of the Baku petroleum fields afforded comparatively little traffic; and for a good part of the year the river is closed to navigation by ice.

Since the productiveness of the petroleum wells has supplied all Russia with light and a great part of it with fuel, the absolute cessation of transportation on the lower part of the stream in winter has become a serious interruption to industry. The development of traffic on the Asiatic Midland Railroad east of the Caspian also suffers thereby, and it has long been evident that the Russian railroad system must be connected with the mouth of the Volga at Astrachan, whose trade is now said to be 500 times as great as it was 25 years ago, while about 60,000 men are employed on its commercial marine—all laid up in winter. In 1898 the freight received and shipped at Astrachan amounted to 5,200,000 tons, valued at \$45,000,000. While petroleum and its products made up 97 per cent. of this tonnage, there was a very considerable trade in cotton (coming from the Asiatic Midland Railroad), in wool and hides and in fish, for which the lower Volga is famous all over Russia. Grain comes down the Volga to supply the local demand in the semi-arid region adjacent to its lower course. Exports of Russian manufactures to Persia and Central Asia are made chiefly by way of Astrachan.

The construction of a railroad to that city, however, has been delayed by a controversy concerning its loca-

tion, whether on the right or the left side of the Volga. This has finally been concluded, and the railroad is to be built on the left or Asiatic side of the stream, where there are some 2,000,000 acres of public lands which at present yield about \$350,000 per year. The new railroad will give an outlet to the salt, which is all that remains of two ancient lakes with an aggregate area of 133 square miles. It is to be built by the Rjasan & Uralsk Co., which already has lines east of the Volga. As these are of narrow gage, the section from the junction to the main line west of the Volga is to be widened to the Russian standard. Work has already been begun.

Notes from West Albany.

As in all other large shops, there are in those of the New York Central at West Albany a number of special devices and methods for doing work which are peculiar to the place, and are worthy of record and imitation. In the first place, Mr. C. H. Quereau, the shop superintendent, has established a regular meeting time for all of the foremen of the locomotive and car departments, for the discussion of matters pertaining to the shop and the work to be done; the two departments meeting separately.

There are usually about twenty men present at a meeting of the locomotive men, and these include the gang foremen of the erecting pits. As it is of importance to the Superintendent of Motive Power to know when an engine in the repair shop will be available for service, the first question discussed is regarding the possibility of turning out such engines on schedule time; and there is a well-considered schedule for this work.

It is a rule that is well lived up to, that an engine must be stripped and the wheels removed within three days from the time it comes into the shop. The boilermaker then makes a careful inspection and gives a date upon which he can have his repairs completed. To this the gang foreman of the erecting shop adds the time for doing his work, and the date thus arrived at is that upon which the engine is scheduled to be ready for service.

The matter is decided by the erecting shop foreman without consulting the machine or blacksmith shop, because the erecting shop is the limiting department. The machine shop can take care of any and all work that may be sent to it by the erecting shop and the same thing holds true of the blacksmith shop.

This date being fixed, a banner is hung on the wall at the end of the pit, which may read as follows:

1878 E 1 B
Div. Moh.
In 12, 20, 02.
Out 1, 12, 03.

which, being interpreted, means: Class E1B. engine, No. 1878 of Mohawk Division, came into the shop December 20, 1902, and will be ready for service again on January 12, 1903. The time that an engine is held for general repairs is, of course, dependent upon the work to be done, and varies from six days to three weeks.

With these figures at hand, a definite schedule is made out every Friday of the engines to be delivered the following week, and on Monday a supplementary schedule, subject to revision, is made out for the week following. The result is that on the first Monday of the month the shop superintendent has an approximate schedule of the output for the first two weeks of the month, from which he can estimate the output of the whole month. If this estimate falls below the rate for the same month of the preceding year, he is in a position to apply a remedy to bring it up to that rate before it becomes too late.

Returning now to the meeting of the shop foremen, the first question discussed is the schedule for the current week. The number of each engine is called off and the gang foreman of the erecting shop on whose pit it is located is asked whether he can meet the date set for its delivery. Whatever may be the cause of possible delay the foreman of the responsible department is there to give a reason for that delay, or to assure the meeting that his work will be done on time.

Suggestions are then asked for and some are usually forthcoming, for the improvement of the shop practice. These are freely discussed, and the meeting then adjourns, after having been in session from a half to three-quarters of an hour, commencing at 5 o'clock in the afternoon.

These meetings are very informal, and the men speak their minds with the utmost freedom, with the result that all points are thoroughly considered, and each foreman knows in just what relation his work for the week stands to the rest. He knows, too, the order in which that work is to be delivered, and each man is in possession of the schedule for the week. Naturally all work, whether in the machine shop, blacksmith shop, boiler shop or any of the other departments, must be turned out in the order of the engine numbers as they appear on the list, a preference being naturally given to those coming first.

A number of interesting features are to be found in the shop practice. For instance, in fitting rod keys they are planed on the edges, but the sides are ground to size on a surface grinding machine. This gives a true and straight edge where it is needed for keying purposes, while the thickness is accurate enough and can be obtained by close forging and grinding in a small fraction of the time previously employed in planing the sides.

The rod brasses, too, are no longer fitted by hand, but are merely bored out $\frac{1}{64}$ in. larger than the pin upon which they are to run. The boring tool leaves a much

better surface than the hand work did, and the looseness is not only no detriment, but has reduced the number of hot brasses on engines just out of the shop by 75 per cent. In boring these brasses the pin is caliper, and if it has worn to a taper from end to end the brass is bored to the same taper, with the result that a continuous bearing for the whole length of the pin is secured, the same as when fitted by hand, but at a much lower cost and a much more satisfactory service.

The packing rings for piston rods and valve stems are cast to size ready for insertion in the stuffing box without receiving any machine work. This, to be sure, cannot be cited as a distinct novelty, but the mentioning of the practice may suffice to remind those who are not working in accordance with it of the economics to be effected by adopting it.

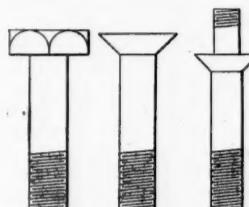


Fig. 1.

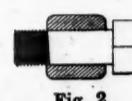


Fig. 2.

The oscillating ring for metallic packing is ground to its seat by a very simple device. It consists of a long shaft reaching up to the line of the countershafting and carrying at its lower extremity a clamp for holding the ring. The weight of this shaft is utilized to furnish the pressure to the ring against its seat, and this, with a rotation of the shaft, with the usual supply of emery and oil, serves to do the work.

In the use of finished bolts the standard practice of working to a taper of one-sixteenth of an inch to

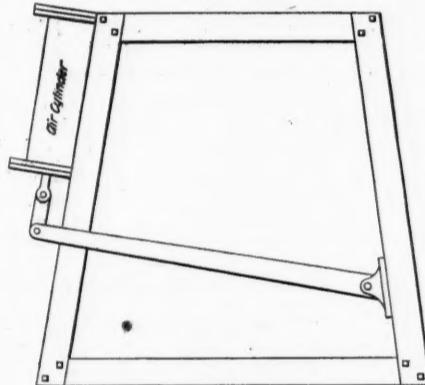


Fig. 3.

the foot is followed, but instead of using single dimensions a scale is used as shown in the table following:

Approximate Diameter of Reamer at Point.

Reamer.	Size at point. In.	Reamer. In.	Size at point. In.
1/16 No. 1	1/16	1 1/16 No. 3	1 3/16
1/16 No. 2	17/32	1 1/16 No. 4	1 7/32
1/16 No. 3	9/16	1 1/16 No. 1	1 1/4
1/16 No. 4	19/32	1 1/16 No. 2	1 5/32
1/16 No. 1	5/16	1 1/16 No. 3	1 5/16
1/16 No. 2	21/32	1 1/16 No. 4	1 11/32
1/16 No. 3	11/16	1 1/16 No. 1	1 1/8
1/16 No. 4	23/32	1 1/16 No. 2	1 13/32
1/16 No. 1	3/4	1 1/16 No. 3	1 7/16
1/16 No. 2	25/32	1 1/16 No. 4	1 15/32
1/16 No. 3	13/16	1 1/16 No. 1	1 1/4
1/16 No. 4	27/32	1 1/16 No. 2	1 17/32
1/16 No. 1	7/8	1 1/16 No. 3	1 9/16
1/16 No. 2	29/32	1 1/16 No. 4	1 19/32
1/16 No. 3	15/16	1 1/16 No. 1	1 1/8
1/16 No. 4	31/32	1 1/16 No. 2	1 21/32
1/8 No. 1	1	1 1/16 No. 3	1 11/32
1/8 No. 2	1 1/32	1 1/16 No. 4	1 23/32
1/8 No. 3	1 1/16	1 1/16 No. 1	1 1/4
1/8 No. 4	1 3/32	1 1/16 No. 2	1 25/32
1 1/16 No. 1	1 1/16	1 1/16 No. 3	1 13/32
1 1/16 No. 2	1 5/8	1 1/16 No. 4	1 27/32

In explanation of this table an examination will show that there are four numbers of reamers for each nomi-

nal diameter of bolt from $\frac{1}{2}$ to $1\frac{3}{4}$ in., dependent upon the diameter of the reamer at the point. This table, in the form of a blueprint, is posted at intervals over the foremen's desks in the erecting shop. Then, when a bolt is to be fitted, the old hole is caliper and the length of the bolt measured. The man then goes to the blueprint, and, selecting a reamer next larger in size than the present diameter of the hole, orders the bolt by length and number, filling out in addition the dimensions called for on a sheet shown in duplicate in Fig. 1 and also giving the number of nuts to be used.

Thus the order may read for a certain number of 1 in. No. 2 bolts 10 in. long, and these will be turned to fit a hole reamed with a reamer $1\frac{1}{32}$ in. in diameter at the point. Attention is called in passing to the fact that the diameters of the reamer points increase $\frac{1}{32}$ in. for each consecutive number of the same nominal diameter. From which it further appears that the schedule provides for every diameter from $\frac{1}{2}$ in. to $1\frac{3}{4}$ in. advancing by thirty-seconds. When the bolt is delivered the hole is reamed to fit. This avoids the possible losses and inherent expense involved in an attempt to turn the bolt to fit the hole. The bolts are turned to a gage of the same diameter and taper, as the reamer and they are so fitted to the gage as to make the body come flush with the bottom of the gage by hand, as shown in Fig. 2.

One of the greatest labor-saving devices about the shop is an oil burner used for welding broken engine frames in position. The advantage of this method is at once apparent in the saving of the labor which would otherwise be involved in the removal of the frames. The butt weld was first tried, and then the scarf, to give way in turn, to a V-weld let in on each side of the frame, with plenty of metal to provide for hammering and holding the frame to its original length.

In addition to the advantage obtained by the non-removal of the frame is the incidental one of being able to watch the progress of the heating at all times.

An oil burner working with gasoline is also used for heating and fitting patches and braces to the boiler, and this is especially convenient where any flanging is to be done, as the final fitting can be done with the pieces in position.

Compressed air is, of course, distributed throughout all of the shops, and is put to the usual wide variety of uses. Among these is that of testing the air-brake piping upon locomotives. As the shop pressure is but 80 lbs. per sq. in., and as the testing pressure should be at least 120 lbs., some method of increase must be used. The one resorted to in this instance is to connect the air pipe to both the steam and air cylinders of the air pump. The pressure upon the two sides of the air cylinder thus counterbalance each other, and that in the steam cylinder is enabled to readily raise the air from 80 to 120 lbs. per sq. in. in the delivery pipe.

Another use of compressed air is that of blowing the portable forges in the erecting shop. A considerable saving in the amount used is effected by means of a jet nozzle in the air pipe, which, acting on the principle of the injector, draws outside air in through side openings and supplies the requisite blast to the fire, without using so great a quantity of compressed air as would be required were the whole supply to be delivered through a closed pipe. Still another use of compressed air is to be found in a sliding platform in front of the wheel press. With the arrangement under consideration the wheel is placed upon the platform and the collar of the axle entered in the hole. Compressed air is then admitted to the operating cylinder, and, as the platform is moved, the bottom of the wheel is carried forward into position, while one man can readily control the movement of the top. The wheel press is also fitted with a recording gage, by which the pressures on the pressing on of the wheels are registered and kept.

In the heating furnaces a mechanical stoker has been successfully used, thus dispensing with the services of a man and securing a much more uniform temperature than is possible with hand firing.

Among the many handy appliances that are in use about the shop but two will be shown. One is used in the car shop for compressing the elliptical springs before putting them in the truck. It is shown in Fig. 3 and consists of a heavy framework, to one side of which a pneumatic cylinder is attached. The piston rod of this cylinder operates a lever, pivoted at one end, and which can be brought to bear against the top of a spring placed beneath it. As it is forced down the spring is compressed and held by clamps until it is in position in the truck.

Finally there is an ingenious arrangement of dies for use in connection with the bulldozer for forming shapes that have a re-entering portion that would be difficult to remove from or form in an ordinary matrix.

For example, take the piece shown in Fig. 4. To shape this there is a male portion with the same contour as the interior and as outlined in A of Figs. 5 and 6. The matrix consists of three pieces; A back B, to the ends of which the side arms, C and D, are hinged. At the starting of the work, the whole is placed across the two ends, F and G, of the rigid portion of the former, E. The straight bar to be bent is laid across it and the machine started. The male portion, A, then pushes the back, B, of the matrix down between the arms, C and D, and these in turn rotate the side arms C and D, causing them to close in upon the male when the movement has been completed the die and piece to be formed stands, as shown in Fig. 6. The backward movement withdraws the matrix from between the arms, F and G, when they can be opened and the piece removed.



Fig. 4.

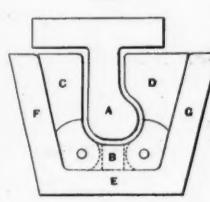


Fig. 5.

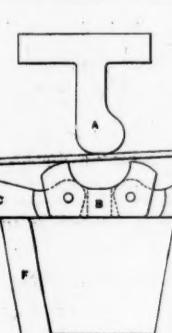


Fig. 6.

Easy Money.

BY A. WINNER.

Are you a victim of ennui? If so let me prescribe a sovereign remedy. I will guarantee to cure the most virulent case of neurasthenia, hypochondria, tic douloureux, glanders, poll-evil, hoof-rot, nostalgia, or bots. Simply secure a position as station agent at the front on the extension of some railroad, say in Utah or California.

It is easy to get such a place. All you do is to make application on a blank which is a yard long by actual measurement, each side containing more pertinent and impertinent questions than were dreamed of during the Inquisition. In the application you are required to state your name in full at present; also the one you flagged under back east; birthplace, and, age last birthday, present height, weight, color of eyes and hair, condition of teeth and toenails; describe minutely any birthmarks on face, hands or body. You give a succinct history of your antecedents, paternal and maternal, and state how many, if any, were hanged for sheep-stealing.

You are asked whether you smoke, drink, chew, or use intoxicating liquors. You give in detail particulars of every position which you have ever held, with cause for leaving same, and furnish addresses of past employers, living or dead. You agree to abide by the thousand and one arbitrary rules already made, provided and set forth; as well as those which shall be issued from time to time in the future. You waive all right, title, and claim to recompense for damages to body, mind or morals, whether caused by the negligence of fellow-servants, or an act of God.

You are placed under bond with a surety company, thereby entering the class with bank cashiers, the Secretary of the Treasury, and other high-salaried officials; but unfortunately your resemblance to this plutocratic nobocracy ceases and determines at the line of emolument.

You next undergo a searching physical examination by the company's surgeon who requires you to strip, while he carefully sounds your lungs, observes the action of your heart, and notes the conditions of the various organs of your anatomical make-up. You then pass a rigid test for auricular defects. The doctor holds a stop-watch first to one ear, and then the other at distances varying from three inches to ten feet, ever and anon pressing the button as he asks: "Do you hear it now?"

Having satisfied himself that you can distinguish the delicate ticking of a telegraph instrument, while a decapod locomotive stands outside the office window blowing off steam and with its bell ringing, he next brings out a bunch of vari-colored yarns to test your eyes for color-blindness. You are required to distinguish not only the colors, but the various shades of white, red and green at a glance. Then you go to the photograph gallery and have some tin-types struck off, two of which you file with your application.

If you have successfully qualified in all these particulars, you are accepted on probation and sent forth into the desert, or the wilderness to prove your worthiness at some obscure, God-forsaken station, where the light and pleasant duties tend to fill your soul with joy, and your pocket with shining shekels, and to engender a feeling of peace and love in your heart toward your fellow-men. At least, if they don't, it's your own fault.

Let us suppose you are sent to the front on an extension of some road. The last 20 miles you ride standing up on a car of gravel in the construction train, and as the end of track is still two miles short of the town at which you are to be located, you hoof it down the grade, carrying your collar-box. You find a telegraph office cut into a box car, or one corner of an unfinished building, which you are to occupy until the station is built.

The instrument is calling your office madly, and in a hush of glad expectancy you open the key and answer, only to receive your first commercial message addressed to a Chinese laundryman. Filing a copy of this, you enclose the message in an envelope, enter it on the delivery sheet, and start out to play messenger-boy, up one straggling street, and down another until you locate your Celestial washee washee, deliver the message, and get his tea-store signature on the sheet. This healthful, diverting pastime devolves upon you a dozen times daily, as a rule just when you have enough work on hand for any two active, energetic men to perform. This particular duty is especially conducive to a happy, cheerful frame of mind for the reason that you receive no pay for it, through the wise provisions of an arrangement between the railroad and telegraph companies.

In the course of a few days the track reaches town and then your joys begin in earnest. The excitement and novelty of seeing the "keers" come in, draws the denizens of the back-country to town from near and far. They examine, rubber, criticize, and comment on every feature of the construction, operation and management of the road, to the cynical amusement of the citizens of the new terminus, already blasé after two days' association with what they have dreamed of and prayed for all their lives.

Although the road is not open for service, it is decided to ship in a few cars of freight to relieve a shortage which has been caused by the heavy rains putting a stop to hauling by team over 25 miles of rough mountain roads. This has been the only method of getting goods into the town for 60 years, and the men and teams engaged in it now find other occupation.

You have no station records, or appliances, and no place to put them if you had. The town dray, a metro-

politan institution inaugurated with the advent of the railroad, backs up in the mud to the cars on the side-track. Rain is falling at the rate of 3 in. per diem as you blithely step up and examine the car-seals and note their reading on the face of the way-bill, after which you jerk open the door by main strength and awkwardness.

A congested mass of merchandise meets your eye, and you proceed to dig out tanks of oil, naphtha and petroleum, sacks of sugar, flour and salt, coffins, horse-shoes, barrels of sheep-dip, paint and molasses; casks of crockery, bath-tubs, crates of vegetables, bundles of iron pipe, bars of iron, steel and other hardware, innumerable boxes of groceries, packages of ales, wines, liquors and cigars, and a choice collection of second-hand household goods, released to a valuation of \$5.00 per 100 lbs., in various stages of decrepitude and dilapidation.

Stevedoring this class of plunder is particularly soothing to your soul, as you recall with what morbid reluctance you move a few of your own household goods during the annual clean-up. You check off on the way-bill every article unloaded, keeping a careful watch for "shorts," "overs" and "bad orders" which must be reported without delay. You tear your hands, and ruin a suit of clothes on the rough freight in the first car you deal with, unless you have thoughtfully donned heavy gloves and overalls.

These things count for little, however, as you realize the strength of character you are acquiring through controlling your temper and repressing a constant desire to swear like a longshoreman; in addition to which is the distinct advantage of physical culture acquired without the monotonous exercises requiring Indian clubs and dumb-bells. In fact, you wake up the next morning sore in every joint and muscle. But you soon get used to it.

Next, by way of variety you do a little brain-work in making out the expense bills. You are required to verify rates and extensions, and footings of weights and charges columns, and see that totals of expense bills correspond, sending corrections when necessary. Now, as relaxation, you put on gum-boots, an oil slicker, and a rubber hat and start up town half a mile through the rain and mud to collect the amount of the expense bills from the merchants receiving the freight. When you are through with this, you can take a rest while you make out the reports for the general office, which is a good antidote for brain-stagnation. You put your remittance, properly classified, in a sack, seal it and after addressing it to the cashier, take it up to the express office.

While you are engaged in figuring, you feel lonesome unless half a dozen of more or less polite individuals interrupt you, inquiring rates on hay, grain, green and salt hides, horns, tallow, cut-feed, sheep, hogs and cattle, glue, lumber, lime, cement, lath, shingles, tan-bark, fire-wood, spuds, butter, cheese and eggs, beans and wool, N. O. S., from Hazel Baker's barn to Smith's Ferry. Perhaps some or all of these articles are offered for shipment, and you cheerfully stop to figure rates, make out shipping receipts and weigh, tag and load the various articles presented, which occupies your leisure time until supper. Even here you have no respite, for before you have fairly begun eating you are called out to send a death message for some one.

When you reach the wire, the despatcher is calling you frantically for car reports, and "OS" of trains in and out; and he jacks you up for leaving without getting "sift" (stop for tea). He then sends you an order as long as the emancipation proclamation covering the movements of three work trains for the following day. You repeat the orders, hunt up the conductors, get their signatures to the orders, send them back and get the despatcher's OK and "complete"; after which he forgets you for 15 minutes. Finally you wander sadly back to the chilly remains of your evening meal, choke them down and hurry through the pitchy darkness and rain and mud to the damp office where you write up a history of the shorts, overs and bad orders, number them, copy them in the impression book and mail them to the stations interested.

You then make out your ticket and freight reports, and daily account statement to the auditor, and balance your cash. This necessitates adding columns of figures a yard long, comprising amounts of expense bills on hand, and is excellent exercise for the brain. You now get down the shipping orders and proceed to way-bill your outward-bound freight for the early morning train. There is not much to this as all you have to do is to refer to the classification, tariffs, rate sheets and exceptions for every article you don't happen to know the rate on; fill out your way-bill, verify your extensions, totaling up the weights and amounts at the bottom of the columns.

When this is done, and your bills are numbered consecutively you get out the big impression book; open it and place an oiled sheet of cardboard on the left-hand page, fish a wet rag from the pail, wring it out, shake it smooth, place it on top of the oiled sheet, turn one page of the book down on it, and put two loose sheets of tissue paper on top in order to send a copy each to the Auditor, and General Freight Agent. You now place your bills face down on the tissues, repeat the process until all the bills are in the book, put it in the big press and screw it down tight.

When regular trains are inaugurated, you have a few light duties added, such as selling tickets, checking baggage, handling express and mail, and making reports covering these various items; weighing sample trunks, making out excess tags, collecting for same and loading the baggage into the car. You are, of course, interrupted a thousand times a day while engaged in these

various occupations by the telegraph and telephone, and personally by parties who take pity on your loneliness and ask enough questions to stump an information bureau.

A dozen or more messages are filed daily which could as well go by train mail, but you have to fight for circuit and work them off. You don't know what minute the superintendent is liable to happen along and find cause for complaint; or perhaps it's the president in his private car with a party of distinguished visitors, who registers a bitter kick at being held up by the track gang, who know the special is due, and cheerfully proceed with malice aforethought to raise the track when they hear the whistle of the engine. At 5 p.m. each day you do a mile and repeat taking the yard for the car report.

I have sketched a bare outline of a few of the pleasant and mildly-exciting duties which fall to the lot of the station agent, who must at all times present a smiling exterior to the public at \$65 per month. What he really has to do would appeal the average man, because he has to do it all at once. The long hours, heavy work, responsibility and princely salary appeal strongly to any one looking for a snap where there is nothing to do but work.

TECHNICAL.

Manufacturing and Business.

The Union Cross Tie Co. has been incorporated in New Jersey to make railroad cross ties. James Cochran and Albert E. Seibert, incorporators.

The Dalhoff Construction Co. of Little Rock, Ark., has increased its capital stock from \$9,000 to \$50,000. The company has on hand about 200 miles of railroad work in Arkansas, Missouri and Illinois.

The American Ry. Equipment Co. has been incorporated in New Jersey, with \$100,000 capital, as a nucleus of a proposed consolidation of railroad supply houses. The incorporators are: K. K. McLaren, Horace S. Gould and Howard K. Wood.

The Arthur Frantzen Company, Electrical Engineers, 225 Dearborn street, Chicago, has moved to larger offices in the Fisher Building. Also the factory, formerly at 225 Dearborn, has been located at 102 E. Van Buren street, with considerably increased space.

The Richards Chair Panel Co., Chicago, maker of the Richards panel-back chairs, which heretofore has had its goods made by contract, proposes to establish and equip a new upholstering factory. The present authorized capital stock of the company is \$30,000. It is proposed to increase the capital stock to \$100,000.

A reprint of the paper by Mr. Charles Day, of the firm of Dodge & Day, engineers of Philadelphia, before the New York Electrical Society on Dec. 17, on "Requirements of Machine Tool Operation with Special Reference to the Motor Drive," which was printed in our issue of Jan. 9, will be sent by mail on application to R. D. Lillbridge, 170 Broadway, New York.

At a meeting of the directors of the Consolidated Ry. Electric Lighting & Equipment Co. in New York, Feb. 11, Isaac L. Rice was re-elected President and J. L. Watson, Secretary and Treasurer. The duties heretofore performed by J. N. Abbott, as Vice-President and General Manager, were added to those of the President, and Mr. Abbott's connection with the company ceased.

The J. S. McCormick Co., of Pittsburg, Pa., makers of foundry equipment and supplies, has increased its capital stock from \$50,000 to \$150,000, and has applied for a State charter. The company has shops at Mauch Chunk and at Pittsburg, the capacity of which has been about doubled during the past year. J. S. McCormick is President, and P. E. Malone, Secretary and Treasurer.

The British Westinghouse Electric & Mfg. Co., Ltd., has secured the last of the contracts awarded by the Metropolitan Underground R. R., London (promoted by C. T. Yerkes), for the electrical equipment of its lines. The contract calls for the motor car equipment. Each car will have four 150 h.p. motors and will be equipped with the electro-pneumatic, unit-control apparatus.

The Paxton-Mitchell Company, Omaha, Neb., makers of Mitchell metallic packing, have appointed Davis & Bryan, Philadelphia, Pa., general agents for the eastern and southeastern Atlantic States for their packing. This packing was described in these columns June 14, 1902. The officers of the Paxton-Mitchell Company are: W. A. Paxton, President; James L. Paxton, Treasurer; Thos. W. Mitchell, Secretary.

In the annual report of the Pressed Steel Car Co. just issued, President F. W. Hoffstot says that his company is now the largest single consumer of steel in the world, and that enough business has been booked and is in sight to insure the full operation of the company's works during the entire year. Issues of the company's gold bonds have been paid off up to Feb. 1, 1903, anticipating installments by payments made out of earnings, and the entire issue now outstanding amounts to only \$3,500,000.

The United States Locomotive Corporation has been incorporated with a capital stock of \$300,000, and has succeeded to the business of the Torbert & Peckham Locomotive, Steam Shovel & Car Works, with offices at 1602-5 Monadnock Block, Chicago, and works at Hammond, Ind. The new works cover 13 acres and have a capacity of over 50 locomotives at one time in the main erecting shops. Mr. Alfred C. Torbert will remain as

the managing officer of the new corporation, Mr. F. A. Peckham retiring.

The Westinghouse Electric & Manufacturing Co. has recently received orders for equipment from the Llewellyn Iron Works, Los Angeles, Cal.; the shops to be equipped throughout for driving by electric motors. Also from the Kern River Power Co., Los Angeles, Cal.; the Philadelphia Tapestry Mills and the Dodge Cold Storage Co., of Philadelphia. The latter is building a large coal crane, to be installed at the Maryland Steel Company's plant at Sparrows Point. The crane will be driven by electric power. The order from the Tapestry Mills is for a duplicate of a 150 k.w., Westinghouse two-phase engine-type alternator now in use there.

Iron and Steel.

The Union Steel & Wire Co. has been incorporated under the laws of New Jersey, with \$125,000 capital.

The American Bridge Co. has been awarded the contract for rebuilding the Baltimore & Ohio R. R. bridge over the Ohio River at Benwood, W. Va.

Bids are asked by Willis Chipman, Toronto, Ont., for steel trestles and tanks at Bridgeport, Ont.; at Edmonton, Alberta, and for another near London, Ont.

John Reis, of New Castle, Pa., has been appointed General Superintendent of blast furnaces, open-hearth department, blooming and plate mills of the Sharon Steel Co. at South Sharon, Pa.

J. M. Topping has resigned as Vice-President and director of the American Sheet Steel Co., and Isaac M. Scott has resigned as auditor. Mr. Scott is succeeded by Geo. M. McGinnis, heretofore Assistant Auditor.

Pittsburg despatches say that Jones & Laughlin will at once build a \$2,000,000 steel rail plant, and also expand \$1,000,000 in the construction of steel mills. Both of the new plants will adjoin the present establishment.

It is announced that Reuben Miller is to retire from the Presidency of the Crucible Steel Co. of America about May 1, and it is probable that Frank B. Smith, the Assistant to the President, and General Manager, will be his successor. Mr. Miller will continue as a director.

Frank A. Lapham, formerly connected with the Cleveland Frog & Crossing Co., and later one of the organizers of the National Steel Co., died in New York City Feb. 18, aged 43. At the time of his death he was General Sales Agent for the Tennessee Coal, Iron & R. R. Co., and recently held a similar position with the Lackawanna Iron & Steel Co.

Canadian papers say that neither the Dominion Iron & Steel Co., nor the Clergue Syndicate will bid for the 25,000 tons of rails wanted by the Department of Railways & Canals for the Intercolonial Ry. Neither company can fill the contract by June 1. The Government will be asked to give the contract to British in preference to German manufacturers.

Collarless Journals—M. C. B. Inquiry.

In order to collect data on which to base its report for the next convention, the M. C. B. Association committee on collarless journals has sent out a circular of inquiry containing the following questions:

1. How many freight cars have you equipped with collarless journals? How many passenger cars have you equipped with collarless journals?

2. State the number of hot boxes for six months found under passenger cars with collarless journals and under passenger cars with collar journals. State the number of hot boxes found under freight cars with collarless journals and under freight cars with collar journals, for a period of six months.

3. Do you use the same dust guard and the same lid for collar and collarless journals in passenger cars, and the same lid for collar and collarless journals under freight cars? If not, please send the committee drawings showing the dust guards and lids.

4. State whether you use filled bearings, solid bearings or solid bearings lead lined with collar journals and also with collarless journals; in other words, are the same bearings used for both kinds?

5. How many collar journals have you found broken under passenger cars and freight cars separately for a period of six months, and how many have been found for the same period having collarless journals due to the fillet being worn at the back?

6. Is difficulty experienced inspecting the journal bearings on account of the journal bearing key covering up parts of the end of the journal where collarless journals are used, and is this difficulty greater than with collar journals?

7. Do your trucks keep square as well with collarless journals as with those equipped with collars, the natural tendency of the collarless journal being to permit the trucks to spread, while with the collar journal the trucks are held square.

Replies should be addressed to F. W. Brazier, Chairman, room 610, Grand Central Station, New York City. The replies should be received not later than April 15, 1903.

Interchange Rules Regarding Metal Cars.

The Rules of Interchange of the M. C. B. Association do not make any provision for settlement for metal cars destroyed on foreign roads. The Arbitration Committee in its report to the next convention would like to propose settlement prices for this class of equipment, and Secre-

tary J. W. Taylor has sent a circular asking for suggestions from the members. Members having these cars in service are requested to give the committee the cost, the kind and the capacity as covered by Rule 110 of the 1902 code.

Paint For Exposed Metal Work.

The metal preservative paint made by the Wadsworth Howland Company, Chicago, and called "Carburet Black" is claimed to be an anti-rust, acid-proof coating, impervious to sulphurous acid drippings from wet coal. The builder of one of the metal dumping cars says that all of the malleable castings for his cars are dipped in "Carburet Black" before being riveted in place and all surfaces to be put together are similarly coated. It is also recommended for bridges, car roofs, smokestacks, locomotive front-ends—in short, for all kinds of exposed iron or steel work.

Important Installation of Nernst Lamps.

The Farmers' National Bank Building, which is to be the largest structure in Pittsburg and one of the tallest office buildings in the world, is to be lighted with Nernst lamps made by the Nernst Lamp Company, of Pittsburg, and supplied by the Doubleday-Hill Electric Company of the same city. The generating plant is to consist of three 150 k.w. and one 75 k.w. machines built by the Westinghouse Electric & Manufacturing Co. There are to be installed 1,000-55 watt single glover, 1,250-88 watt single glover, 20-two glover and 20-six glover lamps. The wiring is to be done by Clark & McMullen, New York.

The Universal Rotary Pocket Measure.

The little device shown in the illustration is a revolving rule. One complete revolution of the wheel means 6 in. of travel. The pointer on the dial registers complete revolutions of the wheel; a complete revolution of the pointer means a travel by the wheel of 15 ft. The pointer may be set back to zero instantly from any position. For measuring straight work it sometimes permits increased speed and accuracy as compared with the ordinary rule or tape. For measuring curved or bent work it is especially rapid, simple and accurate. The measuring wheel is made of hard steel and comes in rolling, not sliding, contact with the work to be measured. The casing is nickel-plated and the handle is made of a black enameled hard wood. It is made by the Steckenreiter Manufacturing Co., 96-98 Lake street, Chicago.

To Bridge the Detroit River.

The Michigan Central has joined with the Grand Trunk in engaging Mr. George S. Morison, Past President, American Society Civil Engineers, to investigate the practicability of building a railroad bridge across the Detroit River at Detroit. He will make surveys, soundings and such tests of the course of the stream as are necessary to decide upon a suitable location for the proposed structure. His report is expected not later than Aug. 1. Should the two roads named decide to build a bridge it is probable that the Canadian Pacific, the Wabash and the Pere Marquette will be given an opportunity to co-operate.

American Railway Lamp Company.

This concern, incorporated a few weeks ago, has the following officers: F. W. Dressel, President; C. H. Dressel, Treasurer, and Robert Black, Secretary, all of the Dressel Railway Lamp Works, 3876 Park avenue, New York. The company will build a shop and is now having plans made, but no decision has been made as to the site.

For a Larger Car Works in Baltimore.

Negotiations are under way for a consolidation of the South Baltimore Car Works, the South Baltimore Foundry, the Ryan & McDonald Mfg. Co., and the National Supply Co., all at Curtis Bay, Baltimore, and possibly some other companies. It is proposed to form a consolidated company, with a capital of about \$3,000,000, to take over these properties, to make improvements and to engage extensively in building steel cars. Of the plants to be taken over, the South Baltimore Car Works builds railroad cars; the Ryan & McDonald Mfg. Co. makes contractors' supplies; the South Baltimore Foundry Co. makes gray iron castings, and the National Supply Co. makes brass castings. Charles T. Crane, Chairman of the Board of Directors of the South Baltimore Car Works, is working out the details.

THE SCRAP HEAP.

Notes.

A Railroad Young Men's Christian Association is to be established in the City of Mexico, and the Mexican Central and the Mexican National Railroads will make substantial contributions to its support.

Chicago papers say that the National Protective Bureau, the passenger men's organization to fight the ticket scalpers, is to have its headquarters in Chicago, and that Mr. F. C. Donald will be Chairman.

On May 1 the New York Central, the West Shore, the Lake Shore and the Michigan Central will have a joint ticket agency in Buffalo. It will be in the ticket office

now occupied by the New York Central, at the corner of Main and Eagle streets.

A verdict awarding damages of \$12,000 has been rendered in a suit of John L. Slaney and others, of New Britain, Conn., against the New York, New Haven & Hartford Railroad for injuries to the plaintiffs by a third [electric] rail on a crossing in Forestville, Conn.

On the evening of Feb. 18, between Los Angeles and Pasadena, Cal., an electric car was stopped by two highwaymen and the 32 passengers were robbed of money and jewelry to the amount of \$500 or more. The robbers were not masked. One of them stood at the rear of the car and covered the passengers with his pistol while the other collected the valuables.

A bill has been presented in the Legislature of New York to require a monitor in the cab of each locomotive. At a hearing given by the Assembly Committee on Railroads various arguments for and against the proposed law were presented. One engineman told the committee that the presence of an extra man in the cab would distract the engineman's attention because, having nothing to do, the monitor would be inclined to talk; "he would be asking me for a match at a critical moment," said the witness.

A bill has been introduced in the Legislature of New Jersey to establish a railroad commission. It would require the Governor to appoint four men for terms of two years each "to have charge of the enforcement of laws relating to railroads." They are to investigate wrecks and fix the responsibility therefor; to decide whether a railroad has the capacity to do the business which comes to it, and to examine all safety appliances brought to their attention. It is proposed that the commission have jurisdiction over electric as well as steam railroads. The salary of each member is to be \$1,500 a year.

A Royal Commission on London City Traffic.

King Edward has appointed a Royal Commission to report on the London traffic and the establishment of a central authority for the regulation of all tube and other transportation schemes, and to give an opinion as to the powers to be granted to such a body. Measures for the improvement of the existing street and underground lines and their connection with each other will also be considered. Among others on the commission are the Chairman of the Great Western, Earl Cawdor, and Mr. George S. Gibb, the General Manager of the North Eastern.

A Twin-Screw Coaster.

A steamer is now building for the New York-Galveston service of the Mallory Line which will be of approximately 5,230 gross tons, and fitted with twin screws. The largest boat now in the coastwise service, exclusive of the off-shore fleet, to Cuba, etc., is the "City of Memphis," of the Savannah Line, which is a trifle larger than the new Mallory boat, but is single-screw. The only twin-screw ship now engaged in the Atlantic coastwise trade is the "City of Savannah," formerly called "La Grande Duchesse," and built for the Plant Line off-shore service.

Street Car Disaster at Newark, New Jersey.

On the morning of Feb. 19 an electric street car was wrecked at the Clifton avenue crossing of the Delaware, Lackawanna & Western Railroad at Newark, N. J., and eight passengers were killed. Twenty or more others were injured and one of these died the next day. All of the victims were high school pupils under 20 years of age, and nearly all were girls, the car being filled with nearly or quite 100 school passengers. The grade approaching the crossing is descending and it is said that the motorman was unable to control the speed of his car on account of the slippery condition of the rails. The gates at the crossing were closed, but the car crashed through them and ran violently against the locomotive of an eastbound passenger train, moving at moderate speed. The street car was badly crushed in front and was overturned.

The Naval Appropriation Bill.

The Naval appropriation bill as passed by the lower House of Congress on Feb. 19 provides for three new battleships, one armored cruiser, and two steel and one wooden training ships; and the Secretary of the Navy is authorized to build these ships at Government yards if any combination among the bidders is shown. A large increase in personnel is authorized: \$10,000,000 is appropriated for armor to be made in this country, and the Secretary of the Navy is authorized, in his discretion, to buy or order submarine torpedo boats, after investigating their merits; and \$500,000 is appropriated for this purpose, no particular type of boat being mentioned.

The International Railway Congress.

The Secretary of State (through the Secretary of the Treasury) has written to the Speaker of the House of Representatives asking for an appropriation sufficient to enable the United States Government to "adhere" to the International Railway Congress, and in connection with his letter he sends a statement, filling 50 pages, (House Document No. 398) showing those facts concerning the Congress which are of most interest to American readers. The appropriation needed is \$400 a year. As the reader is aware, our State Department has expressed its cordial approval of the action of the American Railway Association in inviting the Congress to meet in the City of Washington in May, 1905, but no legislative action has yet been taken. Most of the information given in this document has appeared in the Proceedings of the American Railway Association. One of the exhibits is a statement showing the amounts paid annually by each of the 41 governments which contribute to the support of the Congress. There is also a condensed account of the expenses of the permanent organization for one year, a financial estimate for the current year, brief historical notes of the Congress, the report of the sixth session (Paris, 1900,) as issued by the Secretary of the American Railway Association, and the list of questions to be discussed at the seventh session (1905).

New Post Office Buildings in New York City.

The special commission appointed by the President has made its report to Congress on sites for new post office buildings in New York City. The commission recommends the building of two large branch post offices, one at Eighth avenue, 31st and 33d streets, adjoining the proposed new terminal station of the Pennsylvania Railroad, and over its tracks; and one at, or near, the Grand Central Station, 42d street and Fourth avenue; both to be connected by pneumatic tubes with the general post office at Broadway and Park Row. The commission recommends the appropriation of \$2,000,000 for the purchase of the site at Eighth avenue. The land is now owned by the railroad company. It will not be ready for building purposes for more than a year. The estimated cost of the proposed building here is \$3,000,000. At the Grand Central Station the plans are not so well defined, but the New York Central Company has made to the Government a tentative offer, the proposition being to place the post office building over the tracks. The commission estimates that at the present time the New York Central carries 50 per cent. of the city's mail and the Pennsylvania 40 per cent.

LOCOMOTIVE BUILDING.

The Kuskequa Route is having one locomotive built at the Baldwin Works.

The Vicksburg, Shreveport & Pacific has two locomotives building at the Baldwin Works.

The Missouri Pacific has 10 locomotives building at the Brooks Works of the American Locomotive Co.

The Hicks Locomotive & Car Works has orders to rebuild one eight-wheel locomotive for the Crossett Lumber Co.; one mogul locomotive for the Louis Werner Sawmill Co., and one four-wheel switch locomotive for the Albany & Northern.

CAR BUILDING.

The Mexican Central is having four coaches built by Barney & Smith.

The American Car & Foundry Co. has miscellaneous orders for 303 freight cars and six coaches.

The Chicago Junction is having 66 freights built at the Western Steel Car & Foundry Co., Chicago.

The Boyne City & Southeastern is having 10 freights built at the Russell Wheel & Foundry Co., Detroit.

Thebaud Bros. (New York) are having 180 freights built at the Berwick Works of the American Car & Foundry Co.

The Norfolk & Western is having 500 freights built at the Allegheny plant of the Pressed Steel Car Co. This order was credited to the American Car & Foundry Co. in our issue of Feb. 20, which is incorrect.

The Hicks Locomotive & Car Works has orders to rebuild 80 flat cars for the Susquehanna & New York, and some refrigerator cars for the Albany & Northern; also orders to rebuild one car each for the Cuba Rolling Stock Co., the Boca & Loyalty R. R., the Georgia Northern and the Georgia, Florida & Alabama.

The Illinois Central has ordered 500 box cars of 80,000 lbs. capacity from Haskell & Barker, for July delivery. The cars will be 36 ft. long, 8 ft. 6 in. wide and 8 ft. high, all inside measurements. The special equipment includes: M. C. B. brasses, Trojan couplers, Illinois Central door fastenings, M. C. B. malleable journal boxes and lids and Railway Steel Spring Co.'s springs.

The Chicago Great Western has ordered 200 refrigerator cars of 60,000 lbs. capacity from the American Car & Foundry Co., for July delivery. The cars will be 38 ft. 8 in. long, 9 ft. 5 1/2 in. wide, and 7 ft. 5 in. high. The special equipment includes: Westinghouse air-brakes, National-Fulton Co.'s brasses, Chicago and Tower couplers, Symington dust guards, journal boxes and lids and Barber trucks.

The Great Northern, as reported in our issue of Feb. 20, has ordered 500 coal and ore hopper cars of 100,000 lbs. capacity from the Standard Steel Car Co. The cars will weigh 38,000 lbs., and measure 31 ft. 6 in. long, 10 ft. wide and 10 ft. 4 in. high, to be built of steel, with steel underframes. The special equipment includes: Universal brasses, Tower couplers, Republic friction draft rigging, Harrison dust guards and McCord journal boxes and lids.

The Alabama & Vicksburg (Queen & Crescent), as reported in our issue of Jan. 23, has ordered 100 box cars of 60,000 lbs. capacity from the American Car & Foundry Co., for March delivery. The cars will weigh 32,760 lbs., and measure 37 ft. 11 in. long, 8 ft. 4 in. wide and 6 ft. 11 in. high, all inside measurements, to be built of wood, with wooden underframes. The special equipment includes: M. C. B. axles, American Steel Foundries' bolsters, Damascus brake-beams, M. C. B. cast-iron brake-shoes, Westinghouse air-brakes, American Steel Foundries' couplers, R. R. Co.'s standard doors, M. C. B. draft rigging, McCord journal boxes, R. R. Co.'s standard springs, arch-bar trucks and 33 in. cast-iron wheels.

The Nashville, Chattanooga & St. Louis, as reported in our issue of Feb. 13, is building 500 box cars of 60,000 lbs. capacity at its shops. The cars will be 36 ft. long, 8 ft. 6 in. wide and 8 ft. high, all inside measurements, to be built of wood, with wooden underframes. The special equipment includes: American Steel Casting Co.'s bolsters, Sterlingworth brake-beams, Westinghouse air-brakes, N. C. & St. L. Co.'s brasses, Tower couplers, National door fastenings, Jones door fixtures, Thornburgh draft rigging, N. C. & St. L. Co.'s dust guards, M. C. B. cast-iron journal boxes, N. C. & St. L. Co.'s standard paint, Winslow roofs and Railway Steel Spring Co. springs. They expect to complete this lot of cars by the middle of April, at which time they will continue to build another lot of 500 box cars, the same as mentioned above.

BRIDGE BUILDING.

Akron, Ohio.—Estimates have been furnished the City Commissioners for the joint bridge over Little Cuyahoga River on Cuyahoga street.

Appleton, Wis..—Plans are being made by the City Engineer for a concrete bridge at Pacific street.

Aspinwall, Pa..—A bill has been introduced in Congress and passed by the Senate authorizing the Pennsylvania R. R. to build and maintain a bridge across the Allegheny River, near Aspinwall, Pa.

Altoona, Pa..—A viaduct will be built over the Pennsylvania R. R. between Sixteenth and Seventeenth streets. A. C. Shand, Superintendent at Altoona, is in charge.

Bluffton, Ind..—Appropriations have been made by the County Commissioners for 15 new bridges. Contracts will be let in March.

Boston, Mass..—Bids are wanted March 2 for the draw of Wellington bridge. Address the Metropolitan Park Commission.

Brookville, Ind..—Bids are wanted March 2 by the County Auditor for building two steel bridges.

Chillicothe, Ill..—Bids are wanted March 3 at the County Clerk's office in Peoria for a 125-ft. bridge over a creek in this city.

Cleburne, Texas..—The Railroad Commission has ordered a bridge where the Trinity & Brazos Valley crosses the tracks of the Gulf, Colorado & Santa Fe at Cleburne.

Columbia City, Ind..—Bids are wanted at 2 p. m., March 11, by the Board of County Commissioners, for building 10 bridges, some stone and some steel.

Colusa, Cal..—Bids are wanted March 3 by the County Clerk for a bridge over Little Stony Creek.

Colville, Wash..—Bids are wanted March 9 for a draw bridge over Calispell River.

Council Bluffs, Iowa..—A bill has been introduced in the lower house of Congress authorizing a bridge across the Missouri River at or near Council Bluffs.

Dayton, Ohio..—The Board of City Affairs is considering a new bridge to be built over Miami River at Third street.

The B. of C. A. has passed a resolution permitting the Dayton & Union Ry. to build an overhead bridge at Perry street.

Delaware, Ohio..—Bids are wanted March 9, by the County Auditor, for building a three-span deck plate girder bridge over Big Walnut Creek at Sunbury.

Edmonton, Man..—The Canadian Northern Ry. is preparing plans for several bridges on its line from Grand View, Man., to Edmonton, the most important of which are those crossing the south and north branches of the Saskatchewan River. The bridge at the second crossing of the north branch of the river will be over a mile long. T. H. McLeod, Winnipeg, is Chief Engineer.

Grafton, N. Dak..—Bids are wanted March 3, and contract will be let March 5, for some bridges to be built by Walsh County.

Granbury, Texas..—A bridge will be built over Brazos River by Hood County.

Harrisburg, Pa..—A bill has been introduced in the Pennsylvania Legislature incorporating the Martin's Creek Bridge Co. and the Raubsville Bridge Co., both of Northampton County.

Hill City, Kan..—Bids are wanted March 20, by the County Clerk, for a bridge over Solomon River, for which plans and specifications are on file in his office.

Hot Springs, Ark..—A bridge will be built over Ouachita River, four miles south of Hot Springs, contract to be let soon.

Houston, Texas..—The New York, Texas & Mexican Ry. will need a bridge over the Colorado River, to consist of 5,000 ft. of trestle and a 250-ft. span.

Jackson, Mich..—A concrete steel bridge of two spans is proposed over Grand River. A. B. Stevens, City Engineer.

Kenosha, Wis..—Plans are being made by the City Engineer for a steel bridge to replace the Middle street structure. Estimate, \$12,000.

La Crosse, Wis..—The Chicago, Burlington & Quincy will spend about \$500,000 in improving the Northern Division. The work will include new bridges over the St. Croix and Black rivers and a new viaduct at La Crosse.

Lowville, N. Y..—A bill has been introduced in the State Assembly, appropriating \$7,000 for repair of present abutments of Beebe's bridge over Black River, between Lowville and Watson, Lewis County, and for the erection of a new bridge.

Menominee, Mich..—The Board of County Road Commissioners has decided to build two bridges, one at Stephenson and the other at Birch Creek.

Metamora, Ill..—Bids are wanted March 1 by the Commissioners of Highways at this place, for a bridge.

Moberly, Iowa..—It is said that the Wabash R. R. will build new bridges on the road between Des Moines and Moberly.

Mound City, Kan..—Bids are wanted March 2 by J. A. Cady, County Clerk, for three bridges.

New Castle, Ind..—Contracts were let on Feb. 11 for new bridges owing to the failure of the County Council to specify the amounts for each bridge. New bids will probably be wanted.

Philadelphia, Pa..—The Atlantic Flour Mills Co. will build a bridge over Delaware avenue between Green and Noble streets.

Phillipsburg, N. J..—The Northampton Bridge Co., of Phillipsburg, Warren County, has been incorporated with \$125,000 capital. The Warren Bridge Co., also of Phillipsburg, with similar capital, has been incorporated by the same people: John Haggerty, of Phillipsburg; Harry H. Haines, Waldo H. Swain and John F. Riley, of Easton.

Pittsburgh, Pa..—A bill is in Congress authorizing the Pennsylvania R. R. to build a bridge over the Allegheny River at or near Brilliant Station.

Providence, R. I..—The New York, New Haven & Hartford has agreed to build a bridge over Adelaide avenue, provided the city build the abutments, which are estimated to cost \$6,000.

Purcell, Ind. Ter..—A bill is before Congress authorizing the Purcell & Lexington Street Ry. to build a bridge across the South Canadian River, near Purcell.

Rockford, Ill..—The Rockford & Freeport Electric Ry. will have one bridge over Pecatonica River and there will be several small trestles from 45 ft. to 135 ft. The bridge work is being designed by Weston Brothers, Consulting and Contracting Engineers, Chicago.

Salem, Mass..—The bridge proposed over Danvers River, it is said, will cost about \$50,000.

Spokane, Wash..—Plans have been made for the new bridge over Hangman Creek. The total cost will be \$90,000, \$75,000 of which will be for steel.

Stillwater, Minn..—The Wisconsin Central R. R. is reported considering building a bridge over St. Croix River in the upper end of this city.

Tempe, Ariz..—The Phoenix & Eastern will build a combination bridge 2,000 ft. long over Salt River at Tempe. The foundations are now being built by the company. The steel work which will consist of 1,085 ft. in steel spans, has been contracted for and will also be put in by the company.

Toronto, Ont..—The Toronto & Mimico Ry. has been granted permission to erect a bridge over the creek separating York and Peel Counties, on the extension of its line to Oakville. S. H. Keating, Manager of the Toronto Ry., may be addressed.

A Government Engineer will inspect the site for a proposed bridge at Yonge street. Address the City Engineer.

Tupperville, Ont..—Bids are wanted March 26, by A. McArthur, Township Clerk, with office in the city of Chatham, for a steel drawbridge over River Sydenham.

Other Structures.

Algiers, La..—Morgan's Louisiana & Texas R. R. will build a 30-stall brick roundhouse with 80 ft. stalls at a cost of \$35,000. The work will be done by the company.

Allegheny, Pa..—Fire on Feb. 18 destroyed the foundry plant of Thomas Carlin's Sons' Co., causing a loss of about \$200,000.

Altoona, Pa..—In our issue of Nov. 14, 1902, we told of the extensions being made to the Altoona shops of the Pennsylvania. Some other extensions are now being made. A contract has been let to John Vipond to build an extension to the passenger car shops, which will be 85 x 135 ft. He is also building a two-story brick storehouse for the Juniata shops.

Bangor, Me..—The roundhouse and ten locomotives of the Bangor & Aroostook R. R. were burned on Feb. 20.

Cleveland, Ohio..—The American Ball Bearing Co. will increase its capital from \$25,000 to \$1,000,000 and make extensive additions to its plant.

Crestline, Ohio..—The Crestline Mfg. Co., recently incorporated with \$50,000 capital, will build a machine shop 60 x 175 ft., an iron foundry 100 x 100, and a warehouse 36 x 80.

Durango, Mexico..—The National Iron & Steel Co. of this place will build a furnace of 100 tons daily capacity.

Harrisburg, Pa..—The Harrisburg Mfg. & Boiler Co. has contracted for a steel building 44 x 180 ft., to replace a building destroyed by fire. Contracts will be let soon for an additional building 44 x 165 ft.; also for an electric crane. The company plans to increase its capital stock and to make further extensions.

Kansas City, Mo..—The Massey Iron Works, this city, has been sold to C. E. Faeth, of Sioux City, and the Nichols, Dean & Gregg Iron Co., of St. Paul. The capital stock will be increased from \$100,000 to \$200,000 and the works will be enlarged.

McKee's Rocks, Pa..—The works of the Schulte plant of the American Bridge Company, a subsidiary company of the United States Steel Corporation, at McKee's Rocks, were destroyed by fire Feb. 24, entailing a loss of about \$200,000.

Paducah, Ky..—The Illinois Central will enlarge its shops and add new machinery.

Philadelphia, Pa..—Plans are being made for a new foundry building 90x225 ft. for the Ajax Metal Co.

Springfield, Ohio..—The Webster & Perks Tool Co. will build an addition 200 x 65 ft.

Toledo, Ohio..—The Wilks Foundry Co. will build a new foundry building 100 x 250 ft.

Washington, D. C..—In response to the readvertisement for bids for the new filtration plant at Washington, only two bids for the entire construction were submitted on Feb. 20, both being from Philadelphia companies. The Harmer & Quinn Construction Co. bid \$1,987,183 and the D. J. McNichol Co., \$2,130,710, and as the appropriation for the work is only \$1,358,173, both the bids are far in excess of the amount available, the difference being due to the increased cost of materials. The report on the bids is now before Brig. Gen. Gillespie, Chief of Engineers, U. S. Army, and Congress may be asked to make an additional appropriation for the work.

Waycross, Ga..—The company forming here to build railroad cars will be known as the South Atlantic Car & Mfg. Co., and will be capitalized at \$250,000. Temporary officers have been elected as follows: George Dole Wadley, president; W. A. Price, vice-president; F. M. Hawkins, secretary; directors: G. D. Wadley, A. Sessions, G. R. Youmans, J. M. Cox, W. A. Price, L. Johnson, J. S. Bailey, H. Murphy and P. N. Harley. The plant will cover 16 acres of ground and will be located between the Brunswick & Western Railroad and the Atlantic & Birmingham in the western part of the city.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page xvi.)

Rocky Mountain Railway Club.

At the monthly meeting Feb. 21, Mr. E. E. Whited delivered an address on "Personal Injury Claims of Railroads and Relation of the Employed to Them."

Association of Railway Telegraph Superintendents.

The twenty-second annual meeting will be held at the St. Charles Hotel, New Orleans, La., May 13, 14 and 15. Messrs. Geo. M. Dugan, Superintendent Telegraph, Illinois Central; E. E. Torrey, Superintendent Telegraph, Mobile & Ohio R. R., and Geo. L. Lang, Superintendent Telegraph, Queen & Crescent Route, have been appointed committee of arrangements. P. W. Drew, Secretary, Milwaukee.

The St. Louis Railway Club.

At a meeting held on Friday, Feb. 13, W. J. Thornton, railroad editor of the *St. Louis Globe Democrat*, read a

paper on the "Early History of Railroads in Missouri," and Frank McManamy, Assistant Manager of the railroad department of the International Correspondence Schools, presented a paper on "Theory and Practice of Correspondence Schools," illustrating his address with the stereopticon. Discussion was held on the paper on the "Flexible Car Truck," presented at the January meeting.

At this meeting 17 new members were elected, and 14 applications received. The Club now has 60 members upon its rolls.

Transportation Club of Cleveland.

About 100 railroad men of Cleveland met at the Hollenden Hotel, in that city, on Feb. 14, to organize the Transportation Club of Cleveland. Permanent officers were elected as follows: President, O. A. Constans, Division Freight Agent of the Baltimore & Ohio; First Vice-President, R. H. Wallace, Assistant General Passenger Agent of the Erie; Second Vice-President, W. F. Herman, General Passenger Agent of the Cleveland & Buffalo Transit Company; Secretary, J. H. Brown, Commercial Agent of the Cleveland & Buffalo Line, and Treasurer, J. C. Poole, local freight agent of the Nickel Plate. The annual meeting is to be held the first Monday after the first of January of each year, and the regular meetings are to be held the second Monday of each month.

New York Railroad Club.

The regular February meeting of the New York Railroad Club was held on the 20th. No regular paper was read, but there were discussions on Electrically Driven Shops, Locomotive Front-Ends, Piston Valves and Steam and Air-Line Connections.

The Executive Committee reported the following list of subjects for future meetings:

March, Heating and Ventilating Railroad Shops.
April, Signaling on Single-Track Railroads.
May, Transportation Problems About New York City.
September, Mechanical Stokers for Stationary and Locomotive Boilers; by a committee.
October, Steam Turbines.
November, Advantages and Methods of Operating a Railroad Laboratory; by a committee.

Engineering Association of the South.

The regular monthly meeting of the Association was held at headquarters, Berry Block, Nashville, Tenn., Feb. 12, Prof. W. H. Schuerman presiding. A paper was read by Granberry Jackson describing the water works and electric lighting system of Tullahoma, Tenn. Power for this system is obtained from a fall in Elk River, 10 miles from the town, is transmitted at 10,000 volts, and reduced to proper voltages for use on series-arc system, incandescent system, and for induction motors driving a triplex motor pump. Water is obtained from wells by use of an air lift, and pressure for fire purposes from a tank on a tower 100 ft. high. In addition to this paper Prof. John Daniel, of Vanderbilt University, explained the theory of operation of wireless telegraphy, illustrating the discussion by transmitting wireless signals before the meeting.

The next meeting will be held at headquarters, Berry Block, Nashville, Tenn., March 12.

The Railway Signaling Club.

The next regular meeting of this Club will be held at Hotel Manhattan, New York City, on Tuesday, March 10, beginning at 2 p.m. The principal business of the meeting will be an informal discussion, to be opened by Mr. H. M. Sperry, on the problems which confront the signal engineer in connection with providing adequate block signals for fast trains. There promises to be a good attendance, not only of eastern but of western members, and all members are specially urged to invite their friends among officers of the operating department who are actively interested in the subject to be discussed. The Secretary has in hand a considerable number of applications for membership and these applications will come up for action at the meeting. Many of the candidates will probably be present, and a large attendance of members is desired in order to promote acquaintance between the old and the new.

Mr. Sperry outlines his subject as follows:

1. Our present method, particularly in Automatic Block Systems, is to omit the overlap where the distant signal is provided. Would it not be an advantage to employ both the distant signal and the overlap?

2. Should we consider the use of the following adjuncts?

(a) Automatic stops—and can they be arranged to meet all the operating conditions of two and four-track railroads?

(b) Should they be placed on the surface or overhead?

(c) If operated by an electric current, what would be the effect if the current fails?

3. Audible signals to repeat the visual signals—

(a) Of what type—torpedo, whistle or bell?

4. Are indicators in the engine cab, to repeat the position of the outdoor visual signal, desirable?

(a) Of what form should they be?

(b) Can such indicators be used without the outdoor signals?

5. What attention are we giving to the uniform location of signals so that the governing signal can always be found on the right of the direction of traffic, and next to, or over, the track it governs?

6. Is the use of green for the safety indication meeting with favor?

7. Can anything be done in the direction of reducing the number of high signals, by the use of low or dwarf signals for slow speed diverging routes?

8. In the preparation of time-tables, what consideration is given to the block signal capacity of the line?

On or about March 5 the office of the *Railroad Gazette* will be moved to the building of the Market and Fulton National Bank, corner Fulton and Gold streets, three blocks east of Broadway, and the Secretary's address will thereafter be 83 Fulton street, New York.

PERSONAL.

—Mr. W. H. Coleman, General Freight Agent of the Vandalia Line at St. Louis, died suddenly in the Barnett Hotel in Logansport, Ind., Feb. 10. Mr. Coleman was about 55 years old and had been in the service of the Vandalia for some years.

—Colonel Jonas H. French, well-known in political circles in Massachusetts, died in Boston, Feb. 22. Colonel French was for 10 years a Director of the New York & New England and was once President of the Louisville, Evansville & St. Louis.

—Mr. P. M. Myers, Secretary of the Chicago, Milwaukee & St. Paul, at Milwaukee, died Feb. 18. He was a native of Vermont and was 67 years old. In 1877 he went west as General Manager of the Southern Minnesota and upon the absorption of this company, in 1880, by the Chicago, Milwaukee & St. Paul, was elected Secretary.

—Mr. W. L. Martin, whose appointment to the position of Freight Traffic Manager of the Minneapolis, St. Paul & Sault Ste. Marie at Minneapolis, has been announced, has been with this company over 16 years. Starting as Chief Clerk to the General Manager he was later appointed Assistant General Freight Agent, and then General Freight Agent, from which position he was recently promoted to that above named.

—Mr. Jno. N. Abbott has resigned as Vice-President and General Manager of the Consolidated Railway Lighting & Refrigerating Company, and has severed his connection with its several subsidiary companies, including the Consolidated Railway Electric Lighting & Equipment Co. Mr. Abbott was for many years General Passenger Agent of the Erie Railroad, and subsequently Chairman of the Western States Passenger Association.

—Mr. A. Shields, the new Master Mechanic of the Canadian Northern at Winnipeg, was born in 1866. He entered the service of the old Credit Valley Railway shop at Toronto as an apprentice in 1881. In 1889 he was transferred to the shops at Havelock on the Ontario & Quebec Division of the Canadian Pacific. In 1899 he was put in charge of the air-brake department, and in 1900 was appointed roundhouse foreman. From that time until his recent appointment he has held various minor positions on the Canadian Pacific.

—Mr. Thomas E. Lewis, who was recently appointed Division Master Mechanic of the Baltimore & Ohio Railroad at Cumberland, Md., was born in Brookfield, Mo., in 1870. When about 14 years old he entered the service of the New York, Chicago & St. Louis as an apprentice in the machine shops, but later left this company to go to the Chicago, Burlington & Northern. In October, 1892, he was promoted to the position of engineer, but resigned in 1895 to take a similar position with the Chicago & Eastern Illinois, where he remained until May, 1900. He then became General Foreman for the Norfolk & Western at Portsmouth, Ohio, and was afterwards appointed Master Mechanic of the Cumberland Division of the Baltimore & Ohio.

—Mr. William J. Taylor, of the Taylor Iron & Steel Company, whose death was noted briefly last week, was born at High Bridge, N. J., in 1836. Shortly after the civil war Mr. Taylor assisted his father in operating the iron works at High Bridge, becoming general superintendent of the works. In 1891 he organized the present Taylor Iron & Steel Company, becoming himself a director and general manager of the corporation. Owing to ill health he was shortly obliged to give up the duties of general manager, but remained one of the directors up to the time of his death. Mr. Taylor is the patentee of a steel tired car wheel and also of the Taylor Gas Producer. One of his most useful contributions to the progress of the arts was the introduction of Hadfield's manganese steel into this country.

—Hon. E. Ellery Anderson, a well known politician and senior member of the law firm of Anderson, Pendleton & Anderson, of New York, died at his home on Feb. 24. Mr. Anderson was born in New York city in 1833. He was a Harvard graduate in the class of 1852, and served in the army during the civil war, being mustered out as major. In 1893 he was chairman of a commission in New York city to revise the common school legislation and three years afterwards was appointed a member of the Board of Education. He was a Director of the Montana Union Railway and was a member of the Bar Association and other important clubs and societies. Mr. Anderson was perhaps best known among railroad men by reason of his connection with the Union Pacific. He was a Government Director of this company and in the reorganization he was one of the five Receivers.

—The new Assistant Mechanical Superintendent of the Southern Railway, Mr. John Baker Michael, was born at Baltimore, Md., and is 53 years old. Shortly after leaving school he entered the service of the Sunbury & Erie Railway, afterwards known as the Philadelphia & Erie (Pennsylvania) as machinist apprentice. From then until 1880, when he became General Foreman on the Louisville & Nashville, he held various subordinate positions with different companies. From 1881 to 1885 he was Engineer of the Louisville & Nashville, and for a few months was General Foreman on the East Tennessee, Virginia & Georgia at Macon. In March, 1886, he was transferred to Knoxville, and in January, the following year (1887), he took a similar position with the Southern Railway, which position he has held ever since. Mr. Michael's headquarters will be at Washington, D. C.

—Mr. A. H. Rudd, for the last four years Signal Engineer of the Delaware, Lackawanna & Western, has been appointed Assistant Signal Engineer of the Pennsylvania Railroad, and will have his headquarters at Philadelphia. Mr. Rudd thus goes back to the same company in whose service he gained his early experiences in his profession. He was born at Lakeville, Conn., in March, 1867, and graduated from Sheffield Scientific School in the class of 1886. On leaving college he went to the Pennsylvania Railroad as a draftsman and was in the signal department for four years. In 1892 he went to the New York Central, where he was Signal Engineer and later Assistant Superintendent of Signals in charge of the Hudson Division. In 1894 Mr. Rudd went to the New York, New Haven & Hartford, and was soon appointed Signal Engineer of the Hartford Division. He remained there until April 1, 1900, when he took the place which he has just resigned, that of Signal Engineer of the Delaware, Lackawanna & Western.

—Mr. William R. Trigg, who was President of the Richmond Locomotive Works, up to the time of its absorption in the American Locomotive Company, died at his home in Richmond, Va., Feb. 16, at the age of 54, after a brief illness. Mr. Trigg suffered a stroke of paralysis about a year ago, but this was not the direct cause of his death. Mr. Trigg was born in Richmond and came of a distinguished Virginia family. He was an agent of the Richmond & Danville Railroad when very young, and immediately after the war became Claim Agent of the company. Subsequently he was engaged in banking and was Treasurer of the Richmond & West Point Terminal. His connection with locomotive building began in 1884, and he soon became the executive head of the locomotive works. In 1898 Mr. Trigg organized the William R. Trigg Ship Building Company, of which he was the President until the failure of his health about a year ago. A sister of Mr. Trigg was the wife of Major E. T. D. Myers, President of the Richmond, Fredericksburg & Potomac.

—Mr. Manley B. Cutter has assumed his new duties as General Superintendent of the Lehigh Valley, in charge of Maintenance of Way, Maintenance of Equipment, conducting transportation, Lake Marine and Canal lines. Mr. Cutter was born in 1860. At the age of 16 he began his railroad service as a messenger with the Chicago & North Western. After a few years he resigned to go to the Northern Pacific, and there he remained six years. In 1887 he went to the Chesapeake & Ohio, and for a year was Division Superintendent. He afterwards held a similar position on the Wisconsin Central, but in 1891 he resigned to go to the Chesapeake, Ohio & Southwestern and the Louisville, New Orleans & Texas as General Superintendent; and he held this position until these roads were consolidated with the Illinois Central. Mr. Cutter was for four years Division Superintendent of the Baltimore & Ohio, and then in 1897 went to the Lehigh Valley, where, until this month, he was Superintendent of Transportation.

ELECTIONS AND APPOINTMENTS.

Atchison, Topeka & Santa Fe.—J. W. Tedford, Assistant General Freight Agent, with headquarters at Chicago, Ill., has resigned, effective March 1.

The headquarters of C. T. McLellan, Superintendent, will be moved from Topeka, Kan., to Emporia.

Canadian Pacific.—H. W. Brodie has been appointed Assistant General Passenger Agent of the Western Division, with headquarters at Winnipeg. The notice of Mr. Brodie's appointment to a position on the Canadian Northern was an error.

Chicago & Alton.—F. P. Roesch has been appointed Acting Master Mechanic, with headquarters at Slater, Mo., succeeding G. W. Ball.

Chicago, Rock Island & Pacific.—C. H. Wilmerding, of Chicago, has been appointed Consulting Engineer, in connection with the new shops that are to be built at East Moline, Ill.

Choctaw, Oklahoma & Gulf.—F. A. Molitor, Chief Engineer, with headquarters at Little Rock, Ark., has resigned.

Colorado Midland.—Robert Law, Jr., has been appointed Cashier, with headquarters at Denver, Colo., succeeding W. R. Freeman, resigned.

Delaware, Lackawanna & Western.—M. E. Smith, heretofore Supervisor of Signals on the Scranton Division, has been appointed Signal Engineer, with headquarters at Hoboken, N. J., succeeding A. H. Rudd, who has resigned to become Assistant Signal Engineer of the Pennsylvania at Philadelphia, Pa. Effective March 1.

El Paso-Northeastern.—W. R. Martin, heretofore Division Superintendent of the Galveston, Harrisburg & San Antonio, has been appointed General Manager of the E. P.-N. E., with headquarters at Alamogordo, N. Mex.

Galveston, Harrisburg & San Antonio.—G. F. Hawks has been appointed Division Superintendent, with headquarters at El Paso, Texas, succeeding W. R. Martin, resigned. (See El Paso-Northeastern.)

Great Northern.—J. D. Farrell, heretofore President of the Pacific Coast Company, has been appointed Assistant to the President of the G. N., effective March 1.

Lehigh Valley.—D. G. Baird has been elected Secretary, succeeding John R. Fanshaw, resigned, and E. A. Albright succeeds E. Y. Hartshorne, resigned, as Assistant Secretary. Mr. Albright's headquarters will be at New York city. Thomas O. Cole has been appointed Superintendent of Car Service, with headquarters at S. Bethlehem, Pa. The office of Car Accountant has been abolished.

Mason City & Fort Dodge.—W. B. Causey, heretofore Chief Engineer of the Elgin, Joliet & Eastern, and the Chicago, Lake Shore & Eastern, has been appointed General Superintendent of the M. C. & F. D., in charge of all matters pertaining to construction south of Fort Dodge.

New York, New Haven & Hartford.—J. H. Jenkins has been appointed Assistant General Manager of the Marine District, with headquarters at Pier 19, North River, New York city.

Pennsylvania.—A. H. Rudd, heretofore Signal Engineer of the Delaware, Lackawanna & Western, has been appointed Assistant Signal Engineer of the Pennsylvania, with headquarters at Philadelphia, Pa., effective March 1.

St. Louis Valley.—J. T. Moore, General Freight and Passenger Agent, will also assume the duties of Superintendent, succeeding W. H. Gridley, resigned.

Southern.—Alexander Stewart, heretofore Master Mechanic of the Union Pacific at Cheyenne, Wyo., has been appointed Master Mechanic, with headquarters at Knoxville, Tenn., succeeding J. B. Michael.

Union Pacific.—Alexander Stewart, Master Mechanic, with headquarters at Cheyenne, Wyo., has resigned. (See Southern.)

Wisconsin & Michigan.—J. P. Hopkins has been elected President, succeeding C. H. Bosworth, resigned.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

Anthony, Medicine Valley & Western.—Articles of incorporation have been filed by this company in Kansas. The projected route is from Anthony, Kan., west via Medicine Lodge, Lake City, Belvidere, Buclin and Montezuma to Trinidad, Colo., a total distance of about



350 miles. C. Q. Chandler, Medicine Lodge, Kan., is said to be interested.

ARKANSAS TRACTION.—This company has been incorporated to build an electric line from Harrison, Ark., north to Keener, Lead Hill and other points in Marion County, a distance of 30 miles. Thomas Heim is President, and R. M. Fellows, Secretary, both of Harrison, Ark. C. D. Page, of Rochester, N. Y., is Vice-President.

ATCHISON, TOPEKA & SANTA FE.—See Railroad News.

ATLANTIC, QUEBEC & WESTERN.—Application will be made at the next session of Parliament for an act sanctioning the charter granted by the Quebec Legislature, and for permission to extend the line from Causapscal, Que., southwest to Edmundston, on the New Brunswick boundary. H. O'Sullivan, Montreal, Que., is interested.

BALTIMORE & OHIO.—Contract for building a line from Niles west to Newton Falls, Ohio, 10 miles, has been let to F. H. Clements & Co., of Philadelphia. Work will begin in the near future.

BELLINGHAM BAY & BRITISH COLUMBIA.—Press reports state that this company will build a branch from Hampton Siding west to Lynden, Wash., five miles. Rights of way are now being secured. The new road will extend into a rich lumber country.

BUFFALO & SUSQUEHANNA.—Contract has been let to Mason, Hoge & Co., Frankfort, Ky., to build from Sabula southwest to Dubois and Sykesville, Pa., 15 miles. The line now runs from Keating Summit to Addison, 95 miles, with several branches.

CHOCTAW, OKLAHOMA & GULF.—Contract for building this line from Amarillo, Texas, west to Tucumcari, N. Mex., a distance of 110 miles, has been let to Creech, Lee, Craney & Co., of Fort Worth, Texas. Work will commence about March 8.

CLEVELAND, CINCINNATI, CHICAGO & ST. LOUIS.—An officer denies the current press reports that this company intends to build from Galion, Ohio, east to Youngstown.

COLONIZATION DU NORD.—An officer writes that this line which is building from Labelle, Quebec, northwest to Nominine, 25 miles, has been graded for a distance of 12 miles. Track has been laid from Labelle to Riviere Rouge, a distance of six miles. R. McDonald, Labelle, Que., is the contractor. Hon. F. D. Holland, Montreal, is President.

GULF, CALCASIEU & NORTHERN.—Articles of incorporation have been filed by this company to build from a point near the gulf, south of Lake Charles, La., in a northerly direction to Natchitoches, La., a distance of about 100 miles. The promoters are said to be all business men of St. Charles.

HUNTINGTON, COLUMBIA & NORTHERN TRACTION.—Articles of incorporation have been filed by this company to build from Huntington, Ind., north to Columbia, 20 miles. Capital stock \$50,000. J. A. Kintz, Huntington, is President, and F. J. Heller, Columbia, Vice-President.

IRON MOUNTAIN & GREENBRIER.—It is reported that an extension will be built by this company from Alton north to Huntersville, about 15 miles. The road now runs from connection with the Chesapeake & Ohio at White Sulphur Springs, W. Va., northeast along Anthony's Creek to Alton. Contract for building will be let in the near future. P. B. Houston, of Ronceverte, W. Va., is Chief Engineer. (Aug. 8, 1902, p. 631.)

JEFFERSON RY.—This company has recently been incorporated in Illinois. It is proposed to build a line in Cook County connecting with the Chicago Terminal Transfer, the Chicago, Milwaukee & St. Paul, and the Chicago & North Western. The incorporators and first board of directors are E. A. Munger, F. A. Bangs, Arthur A. Taylor and John Janes, all of Chicago.

KANSAS CITY SOUTHERN.—Surveys are reported in progress from Leesville southeast to Eunice, La., 70 miles. The line will eventually be extended to Crowley, 20 miles south of Eunice.

LA CROSSE & NORTHERN.—This company has been incorporated in Wisconsin to build from La Crosse north to Galesville, 20 miles, and thence in a westerly direction to Winona, Minn. Surveys have been completed as far as Galesville. B. E. Edwards, W. S. Cargill, M. Funk and others, of Galesville, Wis., are interested.

LAKE SHORE TRACTION.—Charter was granted this company on Feb. 19, to build an electric line 14 miles long from Westfield, N. Y., northeast to Silver Creek, Chautauqua County. The line may eventually be extended to Buffalo. A. C. Wade and F. R. Green, of Chautauqua, N. Y., are said to be interested.

LITTLE KANAWHA.—The contract for building this company's line from Parkersburg to Burnsville, W. Va., which was recently let to Rheinhart & Dennis and McArthur Bros., has been sub-let to the Brady Construction Co., Clarksburg, W. Va. (Jan. 30, p. 92.)

MEADOWLANDS & ZEIDKER.—Charter was granted this company on Feb. 11 to build a road five miles long from a point near Meadowlands, southeast to Zeidker, Pa., making connections with the Chartiers Valley and the Baltimore & Ohio. W. L. Merwin, Pittsburgh, is President.

NATCHEZ, URANIA & RUSTON.—At a recent meeting of the directors of this company, it was voted to build an extension from Hinton north to Newport, La., six miles. H. E. Hardtner, President, and C. K. Jones, Alexandria, La., Chief Engineer.

NEW YORK, TEXAS & MEXICAN.—An officer writes that this line, which is now building from Van Vleck, Texas, to Palacios, 40 miles, has been finished as far as the Colorado River, nine miles. J. A. Owens, Galveston, Texas, and Haralson Bros. & McNielly, of Houston, Texas, are the contractors. There will be one trestle 5,000 ft. long over the Colorado River.

NIPISSING & OTTAWA.—Application will be made at the next session of the Dominion Parliament for authority to build a line westerly from the surveyed line to the east end of Lake Nipissing, near the mouth of the French River, and also change the name of the company to the Nipissing, Ottawa & French River. Pearson & Denton, of Toronto, are interested.

NORTHERN PACIFIC.—It is reported that C. E. Hamilton, of St. Paul, is making application to the Manitoba Legislature on behalf of the Northern Pacific for permission to build a number of branch lines in Manitoba. This company applied for a similar charter last year, and the request was refused.

It is reported that contract for the proposed line from Dickinson, N. Dak., west to Miles City, Mont., 150 miles, has been let to Foley Bros., of St. Paul.

OELWEIN & NORTHEASTERN IOWA INTERURBAN & STREET.—This company completed organization in Iowa on Feb. 7, with a capital stock of \$200,000, for the purpose of owning, building, buying, leasing and operating interurban and street railroads in northeastern Iowa. John Jamison is President; Geo. Given, Vice-President, and W. A. Reed, Secretary, all of Oelwein, Iowa.

OKLAHOMA CITY & NORTHWESTERN.—A territorial charter has been granted this company in Oklahoma, with a capital stock of \$15,000,000. The proposed route is from Oklahoma City northwest to Denver, passing through the Counties of Oklahoma, Kingfisher, Blaine, Dewey and Woodward, all in Oklahoma. No plans have as yet been given out and there does not appear to be any prospect of immediate building. C. G. Jones is reported to be at the head of this new enterprise.

OTTAWA, NORTHERN & WESTERN.—An officer writes that the extension which is building from Gracefield north to Maniwaki, via Vouchette Station, approximately 23 miles, has been graded as far as Blue Sea Lake, 15 miles from Gracefield. No track has as yet been laid. H. J. Beemer, Room 30, Central Chambers, Ottawa, Ontario, is the contractor. (Oct. 31, 1902, p. 846.)

PARKERSBURG & OHIO VALLEY ELECTRIC.—This company has been incorporated to build from Williamstown northeast to Sistersville, W. Va., 35 miles, via St. Marys and Friendly. It is proposed eventually to extend the line to Pittsburgh.

PENNSYLVANIA.—Contracts for grading and masonry work on three of the eight sections of the proposed double track between Parkersburg, Pa., and Columbia, have been let to Charles A. Sims & Co., P. C. McManus, and Ryan & Kelly, all of Philadelphia. Work is to be begun at once, and must be completed by Jan. 1, 1904. Contracts for the remaining five sections will be awarded soon. (Feb. 13, p. 124.)

PHILADELPHIA RAPID TRANSIT.—Bids are now being asked for work on section 3 of the underground railroad in Market street, Philadelphia, between Fifteenth and Twenty-second streets. Twelve contractors have been asked to submit bids to W. S. Twining, Chief Engineer of the Philadelphia Rapid Transit.

PITTSBURGH, CARNEGIE & WESTERN (WABASH).—Surveys are reported completed on the Sawmill Run branch of this line, and work will probably begin soon. The proposed route is from the west end of the deep cut leading up to the Mount Washington tunnel, along Sawmill Run to the summit. At this point a tunnel 1,000 ft. long will be built to a point near the head waters of Streets Run. The route then follows Streets Run to a connection with the Union R. R. at Hays. This line, when completed, will afford the Wabash direct connection with the Carnegie mills.

QUEBEC, NEW BRUNSWICK & NOVA SCOTIA.—Application will be made at the next session of Parliament to incorporate a company to build from Quebec southeast to Edmundston; thence to Moncton, N. B., thence to New Glasgow, with a terminus at Country Harbor, N. S.

SAN BERNARDINO & HIGHLAND (ELECTRIC).—This company has recently been incorporated in California to build from San Bernardino north to Highland Junction and thence southeast to Redlands, a total distance of 15 miles. Henry Fisher, of Redlands; Geo. M. Cooney, of San Bernardino, and J. H. Fisher, of Redlands, Cal., are directors.

SAN FRANCISCO, OAKLAND & SAN JOSE.—This company has recorded a deed of trust for \$3,000,000, covering all of its property. The proceeds of the sale of bonds will be used to build an electric line between San Francisco, Oakland and San Jose to connect with the Emeryville ferry at San Francisco. (Nov. 21, 1902, p. 902.)

SUWANEE & SAN PEDRO.—This line, which is now building from Mayo west to Perry, Fla., a distance of 52 miles, has been practically completed. An extension south to Stephensville, on the Steinhatchee River, 30 miles, is projected. R. N. Ellis, Live Oak, Fla., is Chief Engineer.

TOLEDO & INDIANA (ELECTRIC).—This line, which has been built from Toledo west to Delta, Ohio, 25 miles, was opened for business on Feb. 14.

TOWSON-COCKEYSVILLE (ELECTRIC).—This company has been organized in Maryland, to build from Towson south through Ashland and Lutherville to Cockeysville, a distance of about 10 miles. J. F. Cockey, Cockeysville, Wm. H. Wight, Lutherville, Md., and others, are interested.

VEBLEN & NORTHWESTERN.—This company has been incorporated in South Dakota to build from Veblen, S. Dak., north to Hawkinson, N. Dak., about 40 miles. J. A. Brandt, F. P. Bishop and others, of Veblen, are incorporators.

WABASH.—It is stated that this company has employed Elmer E. Piper to examine the title of the Chesapeake & Ohio Canal Co. to numerous disputed tracts which the canal company has taken possession of during the past few years. The Wabash railroad survey which is being made between Cherry Run and Cumberland, Md., runs so close to the canal that in several places it crosses these disputed tracts. The Wabash is at present securing right of way between these points, and for this reason desires to determine the absolute ownership of the lands through which it has to pass.

WEST VIRGINIA ROADS.—Press reports state that a railroad is now being built from Parsons east to the Clover Run Timber Company's mills on Clover Run, Tucker County, W. Va., 6½ miles. Moran & Hassett are the contractors.

WHEELING & LAKE ERIE.—An officer denies current press reports that this company intends to build a double track east from Toledo and south from Cleveland.

GENERAL RAILROAD NEWS.

ATCHISON, TOPEKA & SANTA FE.—At a recent meeting of the directors of this company, a mortgage not exceeding \$10,000,000 was authorized. The *Commercial and Financial Chronicle* says that the present issue will be \$5,600,000, 4 per cent. gold bonds, due Feb. 1, 1923, and that the proceeds will be used on the following lines of the Eastern Oklahoma: Paul's Valley to Newkirk, Ind. T., 183½ miles; Guthrie Junction to Essa, 78 miles; Ripley to Cushing, 10 miles; and Seward to Cashion, 10½ miles, a total of 282 miles.

CANADIAN ELECTRIC.—The Government statistics for Canadian electric railroads during the fiscal year ending June 30 show 558 miles of finished road, of which

553 miles was laid with steel rails. Gross earnings were \$6,486,438, an increase of \$718,155. The operating expenses were \$3,802,855, an increase of \$367,692. The net earnings were \$2,683,583, an increase of \$350,463. The number of passengers carried was 137,681,482, an increase of 16,744,746. Power was supplied in 13 cases by water, and in 27 cases by steam. Of the total number of miles built by electric roads, Ontario has 334; Quebec, 140; New Brunswick, 12; Manitoba, 13, and British Columbia, 45. Only one company has ceased operations.

CANADIAN PACIFIC.—This company is negotiating for the purchase of a large number of steamships belonging to the Elder-Dempster Company, which ply at present between England and Canadian ports. One of the officers of the Canadian Pacific is quoted as saying that the reason for such a purchase is to insure the Canadian Pacific control of vessels for its own ocean traffic.

CENTRAL NEW ENGLAND.—The sale to the Central New England for \$150 by the New York, New Haven & Hartford, through the usual device of an outside transfer, of the celebrated Montague farm, appears to have but one interpretation—it is the letting go of the unpopular end of a long contest in order that the "Consolidated" Company may carry a lighter load in the fight against the new parallel projected between Hartford, New Haven and tidewater, via Middletown, which is apparently backed by the same interests that control the Central New England. Incidentally, the repeal of the general railroad law is sought. This would check any proposed extension of the Central New England to Windsor Locks, and also a potential connection southward with the parallel mentioned. Why a conflict which has cost both companies such enormous sums of money should ever have been entered into, when the Montague farm could be, and actually was, looped by a new line, will remain one of the mysteries of Connecticut railroad legislation. (July 18, 1902, p. 579.)

CHICAGO & SOUTHEASTERN.—This road has been sold at receiver's sale to John T. Dye, Attorney for the Cleveland, Cincinnati, Chicago & St. Louis. It will be operated separately, and will have its own officers. The Chicago & Southeastern runs between Muncie and Brazil, Ind., 127 miles, and has been in the hands of a receiver since August, 1902. (Dec. 12, 1902, p. 954.)

CHICAGO GREAT WESTERN.—At a recent meeting of the stockholders of this company it was voted to increase the common stock from \$30,000,000 to \$50,000,000. This increase is to be used to pay for the Mason City & Fort Dodge, recently acquired by the Chicago Great Western. (Dec. 5, 1902, p. 934.)

CLEVELAND, CINCINNATI, CHICAGO & ST. LOUIS.—See Chicago & Southeastern.

HAMILTON CATARACT, POWER, LIGHT & TRACTION.—This company has been incorporated in Ontario, with a capital of \$5,000,000, to take over the Hamilton Electric Light Co., the Hamilton Street Ry., the Hamilton & Dundas Electric, the Hamilton Radial Ry., and the Cataract Power Co. New improvements and extensions are projected, but no official information has yet been given out.

INDIANAPOLIS & SOUTHERN TRACTION.—A mortgage has been filed by this company, with the Trust Company of North America, Philadelphia, as trustee to secure \$1,000,000 5 per cent. gold bonds, due Feb. 1, 1923. Only \$300,000 will be issued now, the remaining \$700,000 being held for an extension to Columbus and for other improvements.

LAKE SHORE ELECTRIC.—It is reported that this company will spend \$250,000 during the current year for improvements. Part of this will be used in ballasting the line between Toledo and Lorain, and most of the remainder will be spent in acquiring new rolling stock. Fast trains between Toledo and Cleveland are promised.

NEW YORK, NEW HAVEN & HARTFORD.—This company has recently acquired control of the Bridgeport Steamboat Co., which operates a day and a night line of passenger and freight steamers between New York and Bridgeport. John M. Hall, President of the New York, New Haven & Hartford, was elected President of the Steamboat Company, at a recent meeting of the stockholders.

The directors have made provision for issuing a sufficient amount of new stock to take up the \$16,397,200 of convertible debenture bonds of 1893. These bonds are convertible into stock at par if presented between April 1 and June 1 of this year. Such of the bonds as are not converted within that period will be paid in cash on April 1, 1908.

NORTHERN PACIFIC.—Judge Amidon, of the United States Circuit Court in Minnesota, has dismissed the suit brought by the United States against the Northern Pacific Railroad, the Northwestern Traction Co., and the Western Union Telegraph Co. This suit, to revoke the charters of these companies, was begun by the government in 1880, on the ground that the Northern Pacific Company had violated the Act of Congress, Aug. 7, 1888, by neglecting to maintain a commercial telegraph line. The Judge found that the company had always maintained and operated for railroad, governmental, commercial, and other purposes a line of telegraph coextensive with its line of railroad.

PENNSYLVANIA.—The Appellate Division of the Supreme Court has recently handed down the following decision with regard to the proposed tunnel to be built by this company under Thirty-second and Thirty-third streets: Three commissioners are to be appointed by the court, to hear the property owners along the route, and if they report favorably, the Pennsylvania may begin work immediately, and thus avoid the necessity of obtaining individual consent from the property owners.

SEABOARD AIR LINE.—The gross earnings for this company for the fiscal year ending June 30 were \$10,922,495, as against \$10,426,279 in 1901, an increase of \$406,216. The operating expenses in 1902 were \$7,183,816, and in 1901 were \$7,401,421, a decrease of \$217,605, making a total increase in net earnings of \$713,821 for the fiscal year.

SOUTHERN PACIFIC.—It has been officially advertised that application will be made to the Texas Legislature, now in session, by the Texas & New Orleans Co., which is a part of the Southern Pacific System, for authority to sell its Sabine Pass-Dallas line. No information has been given out as to who is the prospective purchaser.

TEXAS & LOUISIANA.—A bill has been introduced into the Texas State Senate authorizing the purchase of the Texas & Louisiana by the St. Louis Southwestern.